# SOUTHERN POWER AND INDUSTRY

JUNE 195

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  Ligget & Myers Tobacco Co.—Durham, North Carolina

#### ASME SPRING MEETING - ATLANTA

Cooling Tower Symposium

Operating Experiences in Central Gulf Area
Deterioration of Weed in Cooling Towers
List of Papers and Authors, Shown in Reprint Information

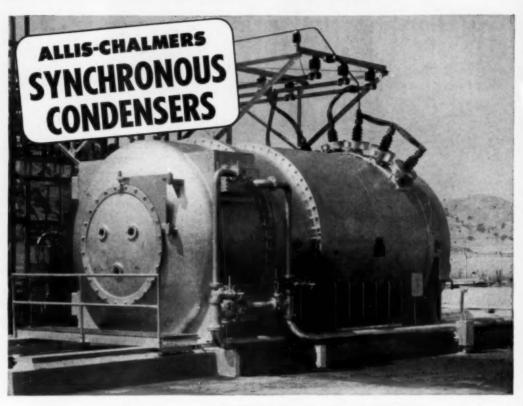
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# Southern California Edison Stabilizes Transmission System

With Allis-Chalmers Hydrogen-Cooled Synchronous Condenser

This 40,000/16,800 kva hydrogen-cooled synchronous condenser supplies reactive kva to regulate voltage and stabilize the far-flung transmission lines of Southern California Edison. It is one of several similar Allis-Chalmers machines built and building for large power systems with relatively long transmission lines. All are custom built to fill system requirements and incorporate proven Allis-Chalmers

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JUNE 1951



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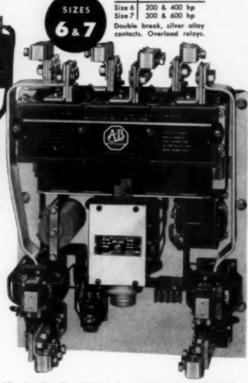
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## Facts and Trends

#### FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

June, 1951

DALLAS, TEXAS, will be host to the Oil and Gas Power Division of the A.S.M.E., June 25-29. DIESEL ENGINES and their auxiliaries will hold the spotlight with some 30 manufacturers exhibiting; papers from engineers of Nordberg, Cooper-Bessemer, and Clark Brothers; panel discussion on gas-engine maintenance; and a unique field trip by plane to two widely scattered Texas industrial plants.

The 500 mile inspection trip by air will cover Alcoa's Point Comfort aluminum plant where 120 Nordberg engines generate 120,000 kw (see SP&I for July, 1950) and the Halliburton Cement plant at Corpus Christi, which manufactures cement from sea shells. The 8,000 hp Fairbanks-Morse diesel installation in the latter plant is featured in this issue of SP&I.

- THE SOUTHWEST POTASH COMPANY at Carlsbad, New Mexico, will soon use an UNDERGROUND PORTABLE SWITCHHOUSE to protect mining machines, drills, blowers, and rectifiers for shuttle car power supply. The unit, being built by Westinghouse, will be used to isolate individual mining equipment setups fed from a main 4160 v primary cable, without disturbing continuity of service to other feeders. Maximum height will be 42-in. Portability is achieved by mounting the switchhouse on a skid plate.
- GEORGIA POWER COMPANY'S Plants Yates, Atkinson and Arkwright have three different types of BOILER FEED CONTROL SYSTEMS. These Copes installations are featured in a recent bulletin of the Northern Equipment Division—three—influence control through the hydraulic couplings of the boiler feed pumps at Plant Yates; conventional three—influence control using a feed control valve at Plant Atkinson; and two-element air-operated control at Plant Arkwright.

The most important factor in dependability of such equipment is a regular program of inspection and preventive maintenance. Recommended MAINTENANCE PROCEDURES for direct operated and relay operated feedwater regulators are featured in this issue of SP&I.

PUBLIC SERVICE COMPANY OF OKLAHOMA has scheduled a 15,000 KW GAS—
TURBINE generator for installation in the Bartlesville area. The
700,000 lb Westinghouse turbo-generator installation will consist of
the gas turbine as the primary source of power, driving a hydrogen—
cooled generator. Gas turbine will comprise high and low pressure
turbines driving high and low pressure compressors, respectively,
with the high-pressure turbine also connected to drive the generator.
Intercoolers will reduce the temperature of the compressed air between stages of compression and a regenerator will apply exhaust-gas
heat to the air before it enters the combustor to reduce consumption
of fuel.

Turbines will operate at a temperature of 1350 F—300 degrees higher than even the hottest steam temperatures in use today in electric generating stations, and about twice as high as the temperature of the average steam generating plant. Speed of the turbine will be 3600 rpm. At full load, compressors will draw in seven and a half tons of air every minute.

NEW ORLEANS, LOUISIANA, is enjoying an all-time high industrial boom with new industry moving into the city's metropolitan area on a major scale. CHRYSLER CORPORATION has been assigned the use of the Michoud Industrial Facilities to build Continental V-12 engines under a \$99

million contract. About 6,000 will be employed. KAISER ALUMINUM & CHEMICAL CORPORATION'S \$70 million aluminum reduction plant at Chalmette will employ 1,000. About 750 will be employed in the new \$4 million twine plant now under construction by INTERNATIONAL HARVESTER.

DELTA MATCH CORPORATION'S \$2 million plant will be the South's first match factory. Another "first in the South" will be Red Star Yeast and Products Company's \$1,500,000 dry yeast plant. PLYMOUTH CORDAGE COMPANY'S manufacturing operation will produce manila, sisal and hennequen cordage for Southern distribution. PAN-AM SOUTHERN CORPORATION'S \$6 million expansion will include the first "cat cracker" in the metropolitan New Orleans area and RHEEM MANUFACTURING is expanding considerably to handle the production of ammunition for the Birmingham Ordnance District.

- CALVERT CITY, KENTUCKY, near Paducah, will be the location of the new \$10 million Air Reduction Company's plant to be operated by National Carbide. With initial rated capacity of 142,500 tons of calcium carbide a year, the plant will be about the same size as the present National Carbide Louisville plant, which pipes acetylene gas, generated by adding calcium carbide to water, to nearby plants of the B. F. Goodrich Chemical Company and E. I. du Pont. Apart from its use as a chemical building block, calcium carbide is the primary source of the fuel used in the oxyacetylene welding and cutting processes.
- TWO HUGE SOUTHERN PLANTS are involved in the massive tri-company production of the 600 mile-an-hour, 185,000 lb Boeing B-47 Stratojet. Boeing will furnish engineering, tooling and other technical information for the program and is already in production at their Wichita, Kansas division. Douglas Aircraft Company will produce at the reopened government plant at TULSA, OKLAHOMA, and Lockheed Aircraft Corporation is well underway on preliminary planning at the huge facility at MARIETTA, GEORGIA.
- NORTHEASTERN OKLAHOMA has reported its third major industrial expansion within the past several months. The \$4 million NATIONAL GYPSUM plant to produce paper for use in making wallboard, and the CORONADO MANU-FACTURING CO.'S \$4 million wrapping paper plant are now under construction. Process steam will be obtained from the adjacent Oklahoma Ordnance Works. New industrial addition to the area is MIDWEST CARBIDE COMPANY of Keokuk, Louisiana, scheduled to build a \$3 million carbide plant utilizing local deposits of coal and limestone.
- ENGINEERING TRENDS noted at the A.S.M.E. Spring Meeting in Atlanta, Ga.

  —users of industrial steam generating equipment urged by Sinclair
  Refining Co. engineer to turn to MULTI-FUEL BURNERS as a means of
  achieving maximum economy and flexibility demanded by the national
  emergency. Installation of multi-fuel burners capable of burning any
  fuel—solid, liquid or gaseous, either alone or in combination—would
  make manufacturing units served by such equipment "practically independent of the effect of strikes and shortages".

WOOD WASTE USED AS FUEL can yield more than one-half the heat value of the best grade coal in properly engineered powerhouse installations. Installations in which energy recovery amounted to 8,000-8,500 Btu per 1b of wood waste were reported. Typical installation consists of the collection and transport system; the bin, its related conveyors and controlled feeding arrangements; and the boiler and generating equipment. It is necessary to have all components in perfect balance as hazardous conditions will result unless provided for in the initial stage of the design. For typical well engineered installation, check "Wood Waste Disposal at Century Furniture, Hickory, North Carolina", page 64, Southern Power & Industry for April, 1951.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY 806 Peachtree St., N.E. Atlanta 5, Ga.

2,574,000 TONS CRUSHED COAL

(WITHOUT OVERHAULING)



23 Year Old AMERICAN CRUSHER Now Ready For **NEW Career** 



Far from being ready for retirement, the 23-year-old American Crusher. whose rotor is shown here, was recently overhauled and transferred to its new home at the Arkwright Mine in Morgantown, West Virginia-where it is now prepared to start a new and productive life.

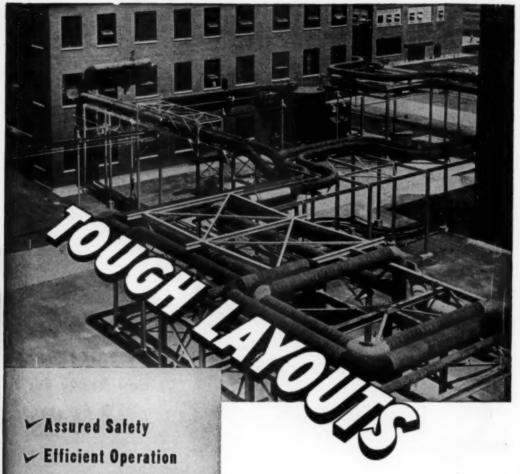
Since 1927 this mechanical "old faithful" has reduced over 21/2 million tons of 6-inch lump to minus 3/4 inch screening-at a total parts-replacement cost of only \$.0007 per ton (including the recent reinstallation costs).

Only such features as the exclusive, patented Shredder Ring-originated and perfected by American-could produce such long-lived, economical performance as shown in this typical case history. When you plan to purchase a coal crusher, plan to investigate the built-to-produce American Rolling Ring Crusher.

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dependable power, in spots where failure would incur great cost because they have a reputation for unfailing dependability-backed by sixty years of transformer building experience,

Bulletin TU-181 tells the complete story of Wagner Power and Substation Transformers, Write for your copy.

Wagner maintains 31 branch offices, located in principal cities, for quick, convenient engineering service and consultation. Call your nearest branch for competent advice on your next transformer installation.



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DUAL-FUEL INSTALLATION!
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dual-fuel engines.
2-10 cylinders—2,000 hp. each @ 300 rpm.
2-8 cylinders—1,600 hp. each @ 300 rpm.

25,000,000 LOW COST Kw-h per YEAR with FAIRBANKS-MORSE DUAL FUEL POWER!

The basic and important economies of Fairbanks-Morse dual-fuel engines are amply evident in the first year's record of this 7200 hp. installation. Here are a few facts that should interest anyone who wants low-cost, unfailing power generation.

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Look over these facts—then look into the matter of gaining the economies of dual-fuel operation in your plant. When you do, remember that there are more Fairbanks-Morse dual-fuel installations than any other—that Fairbanks-Morse has more dual-fuel experience—and that field conversion parts are available for many sizes and types of Fairbanks-Morse diesel engines. Write your nearest Fairbanks-Morse branch office or Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois.

## Look at this Six Months Performance Record!

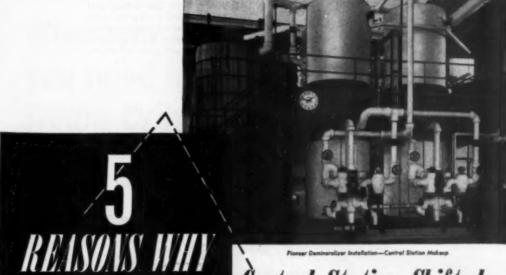
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1950	Kw-h Generated	Gus, MCF	Cu. ft. gas per kw-h	Fuel oil (Gals.)	#1 2000 hp.	Engine #2 1600 hp.	Heurs #3 2000 hp.	#4 1600 hp	Lube Oil (Gals.)	Hp. hrs. per gal lube
JULY	2,305,100	25,505	11.06	15,489	682	597	606	530	984	4,450
AUG.	1,931,300	21,814	11.29	13,235	568	503	503	558	831	4,613
SEPT.	2,116,800	22,507	10.63	15,698	613	539	642	525	891	4,709
OCT.	2,174,900	23,769	10.92	15,300	607	576	577	587	894	4.741
NOV.	1,913,800	21,225	11.09	15,909	538	578	449	584	931	4,117
DEC.	2,333,800	25,157	10.73	18,596	666	517	656	615	891	5,000
Total	12,775,700	139,977		94,227	3,674	3,310	3,433	3,399	5,422	4,601



FAIRBANKS-MORSE,

a name worth remembering

DUAL-FUEL AND DIESEL ENGINES + ZC ENGINES + PUMPS ELECTRIC MOTORS + LIGHT PLANTS + GENERATORS + SCALES



# Central Station Shifted from Evaporators to Demineralized Makeup

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This demineralizing and silica removal plant replaces evaporators previously used on three of the most recently installed boiler units. It is expected to eliminate any need for evaporators on a scheduled 1800 psi unit. Treatment equipment consists of three sets of Catex\*-Anex\* demineralizing and silica removing units with one aerating tower for the removal of carbon dioxide. Infilco "F" Valves afford automatic operation of the demineralizers.

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SERVING THE POWER PLANT FIELD WITH WATER CONDITIONING EQUIPMENT THAT'S

<u>Quality</u> Engineered for <u>Quality</u> Performance

INFILCO INC.

TUCSON, ARIZONA

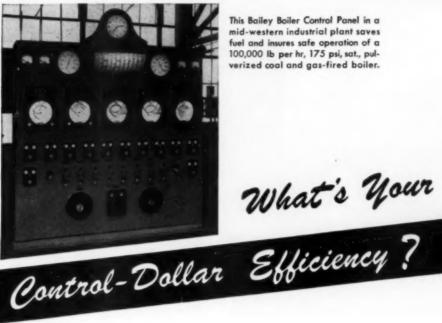
WITH OFFICES IN PRINCIPAL CITIES

- ASSURED AMPLE SUPPLY... demineralizers can always operate at rated capacity whereas evaporator output varies with turbine load and evaporator condition.
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- LOWER MAINTENANCE COSTS... minimized corrosive CO2 content reduces corrosion problem throughout the feedworder system, boilers and turbines and eliminates costly evaporator cleaning.

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- 3. Direct Sales-Service conveniently located near you. Bailey Meter Company's sales-service engineers are located in more

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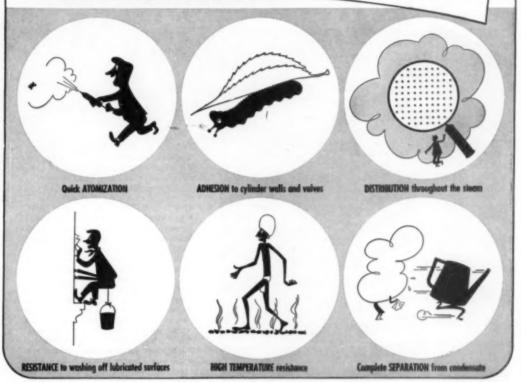
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los Steam Plants Controls

## Whatever you need in a Steam Cylinder Oil...

# Sinclair has it!



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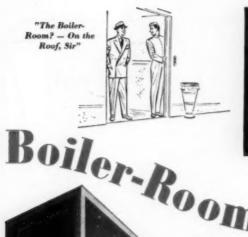
A Sinclair lubrication engineer will help you select the proper oil for your particular service.

# SINCLAIR Steam Cylinder Oils

for every steam engine installation

For lubrication counsel see your nearest Supplier of Sinclair Products or write Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.





The "First of Tulsa" Boiler Room Two Cleaver-Brooks 200 hp. Gas Fired Bailers

#### Boiler Room Directly Behind Roof Sign

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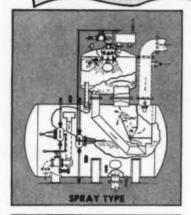
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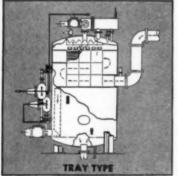
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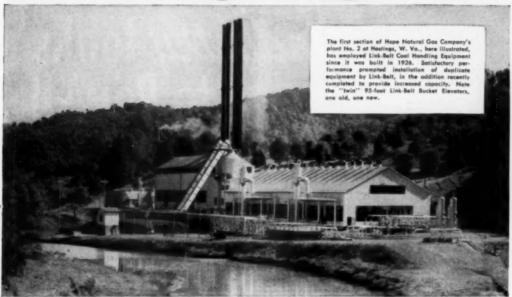
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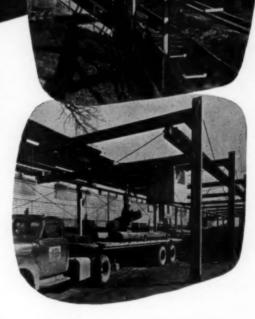


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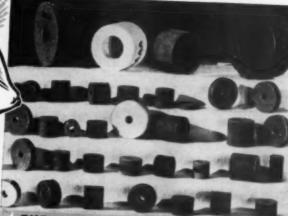
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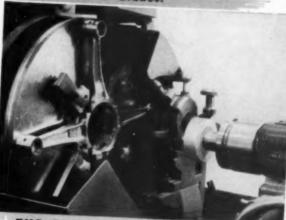
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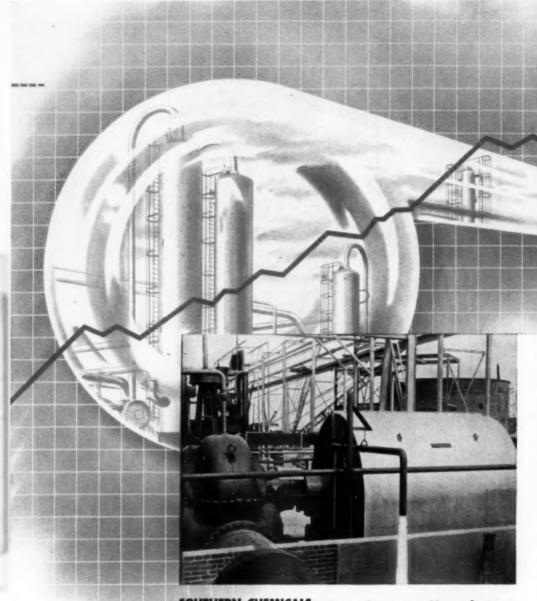
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Typical fast grower: the Southern chemical industry. Since 1939, sales volume has quadrupled, now tops \$4 billion annually (third highest Southern industry). Yearly payrolls of 36 billion dollars go to 200,000 employees.

Topnotch electrical equipment helps the industry keep costs down, sales up. Take the big 1,500-hp motor shown above in a large chemical plant in Texas. The atmosphere is corrosive. To cool the windings they once had to build costly air-conditioned houses around these motors. So Westinghouse engineers designed a water-cooled-enclosed motor. It worked like a charm. Now, no more houses, cool safe windings. In thousands of ways like this, Westinghouse helps industry cut costs. And lower costs eventually mean more sales and more growth.

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# Why is the South's share of the national income up 25%?

Carve up the total U. S. income. In 1929 the South got one-fifth. Today the South's share is one-quarter—a 25% increase. Americans are making more money than they did twenty years ago. But Southerners are gaining almost half again as fast as the rest of the nation!

One big reason is the growth of Southern industry. Since 1939, the value of goods made in the South has climbed 248%. Plants are bigger, new plants are building. And, just one new average-sized plant requires an investment of \$100,000, writes \$200,000 worth of pay checks per year, pays out one million dollars annually in trade expenditures!

Westinghouse is proud to have played a part in this growth. Industry needs power; and much of the South's generating apparatus was engineered by Westinghouse. At the receiving end of the power line, Westinghouse developments help industry use power more efficiently to produce better products at lower cost.

Early in the company's history Westinghouse built plants of her own in the South. These plants now employ some 8,000 Southern workers and executives. They use raw materials from Southern mines, mills, farms and forests.

As a supplier to the South, as a customer, as a Southern producer, we have become a basic part of the South—with deep roots in the soil, a basic stake in its future. When you have a problem in making or using electricity, your nearest Westinghouse office is a good place to go. J-02005





Jeffrey Belt Conveyors are used for long hauls-both horizontally and on the incline. Jeffrey Steel Apron Conveyors (left) for large capacities and short houls. Both available in widths to suit requirements.

When most people think of coal they think of Jeffrey. That's a good habit to get into for Jeffrey moves a lot of coal in a year's time by some method or other. Two ways are shown here . . . two ways of moving large tonnages day after day.

If you want to speed coal (or other loose bulk material) on its way—tell us about it. Likely we have worked out the best possible way to do it, using hundreds of installations in the past. Your handling problem may be different. Give us a chance at it. Our engineers will be glad to help you. Write today.

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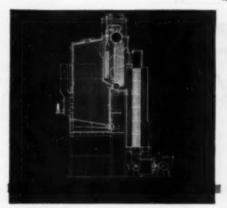
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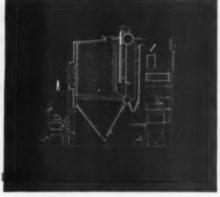
# ONE VU LEADS TO ANOTHER



VU-10 Unit fired with C-E Spreader Stoker (dumping grate type), VU-10 Beilers range in capacity from 10,000 to 60,000 lb of steam per hr. May also be fired by underfeed or traveling grate stokers, or by oil or gas.



VU-30 Unit fired with natural gas or oil. Design provides for future pulverized coal firing. Capacity of unit shown is 350,000 lb of steam per hr; operating press.—920 ps; steam temp.—903F.



VU-50 Unit fired with polverized coal using C-E Raymond Bowl Mills. The capacity of unit shown is 150,000 lb of steam per hr; operating pressure—600 psl; steam temperature—700F.

When VU Boilers were first put on the market, all of them, quite naturally, find to be sold. Now a very substantial percentage are bought. Bought by companies that know by their own first-hand experience what they can expect in day-in and day-out performance—for example:

A paper company some years ago, in urgent need of more capacity, purchased a VU Unit. It went on the line, and—under wartime demand-stayed there for 432 days without a shutdown. What do you think they bought when next in the market in 1946? That's right . . . another VU (much bigger than the first).

An automobile company installed its first VU Units (2) in 1947. Two more were ordered for another of its plants in 1948; then three more units for a third plant in 1949 and two more for still another plant in 1950.

A refinery ordered its first VU Unit in 1937. In 1941 another was installed and still another in 1950. For another of its plants two units were ordered in 1942 and a third in 1947.

An electric willity company installed its first VU Unit in 1941.
Two more units were ordered for another of its plants in 1947, a unit for a third plant in 1946 and still another for a fourth station in 1949.

And so it goes—in all sections of the country—and abroad—industry after industry ordering and reordering VU Boilers. There must be a reason—and there is. The VU's advanced design, rugged construction and consistent reliability have become a service-proved answer to lower steam costs. You can choose VU with confidence based on the experience of companies in your industry, in your area.





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SOUTHERN POWER & INDUSTRY for JUNE, 1951

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SOUTHERN POWER & INDUSTRY for JUNE, 1951



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Thousands of dollars worth of hides pass through drying chambers every day, in this New England Tannery plant. Who can watch the thermometers and run around turning valves fast enough to prevent the hides from "burning"? Who knows whether the equipment has been run at top capacity with a minimum of precious fuel used?

No human being can claim perfection on a job like this—but Sarco can, and proves it every day on a score of different kinds of drying operations in a dozen industries.

In the plant illustrated, the inexpensive Sarco LSI increased production with the same equipment and operators — and without losing hides due to incorrect drying temperatures.

IN YOUR PLANT it may be a temperature control on hot water or a few dollars spent for individual traps on every steam coil that will boost production with less fuel, and insure a better, more uniform output. A few of the Sarco Products that do just that are shown at the left. Send us a sketch of your heating processes or ask to have the Sarco man near you look over your plant.

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# **Timely Comments**



# Shipping Hazards Reduced

NOT ONLY is the new Compartmentizer for rail cars, just announced by Pullman - Standard Car Manufacturing Company, a worthy development in

its own right, but it marks a trend in industrial planning that must be continued and expanded. The finished product must be protected. Where labor has been expended on any item, its value is so increased that old packing procedures, old storage techniques and old transportation methods will stand improvement.

When eggs were a dime a dozen and hens did all the work, packing consisted of a paper bag, but with modern costs of mass produced feed and educated care of the flock, egg value calls for something special in way of packing. The same is true of goods and machinery—industry does not feel it can long bear the high cost of loss in transit. Therefore much emphasis is being placed on shipping procedures.

B. M. Angell, designer and patenter of the Compartmentizer, is originally from Birmingham, Alabama where he had long experience in the transportation field. In recent years, as Vice-President of Stokley Foods Incorporated, his interest and activity in railway shipping has continued.

The P-S Compartmentizer, developed from Mr. Angell's design has been thoroughly tested and proven by Pullman-Standard's Research and Development Department. Now it is ready for actual field service and is being actively advanced by Pullman. A Compartmentizer equipped car was on exhibit at the recent National Materials Handling Exposition in Chicago, and received wide attention.

The Compartmentizer prevents the shifting and consequent damage of freight. It consists of pairs of steel gates which are pivoted at the side walls of the car and meet at its logitudinal center line. Each gate is pivoted from a vertical member that is carried by a trolley running on a track which is fastened to the side plates near the roof and extends the full length of the car. Consequently, the car can be divided into various compartments the size of which may be varied in increments of 3 inches.

How far we can go toward reducing consumer cost by such developments remains to be seen, but certainly the high cost of distribution is an important element of delivered price, and it will continue to be studied by inventors and production men in their effort to give the buyer the most for his dollar.

# Tax Relief for Research

RAPID EXPANSION of governmental research activities threatens to draw scientists away from industrial laboratories, thereby reducing the

ability of business firms to develop new products and processes, said H. McKinley Conway, Jr., Director of the Southern Association of Science and Industry, speaking recently before an Industry and Economics group in Atlanta.

While some two-thirds of the country's professional scientists are already working on Federal projects, in the South we find that our research groups are devoting more than three-fourths of their efforts to Federal programs. Not only are scientists leaving industrial positions to work on Federal projects, but industrial firms find it difficult to employ new graduates because they are more interested in defense research which offers better prospects of draft deferment.

Because of the trend toward Federal employment of scientists, Mr. Conway continued, scientific manpower is getting to be the most acutely scarce industrial commodity in the current defense program. It is a shortage, moreover, which industry cannot make up overnight.

One remedy suggested by Mr. Conway is for the government to set up a system under which industrial firms may assume greater responsibility for essential military research, both fundamental and applied. If industrial firms could be encouraged to undertake more of the research needed by government, the participating firms could hold their scientists and later apply the knowledge gained in defense work to the development of new products.

To stimulate the conduct of a greater volume of research by industrial firms, Mr. Conway proposed a plan wherein firms willing to carry programs of special interest to the military agencies would receive special tax relief. Specifically he suggested that industrial firms be allowed to amortize new laboratory construction and other research costs over a five-year period as compared with the usual twenty-year period required in tax computations. Also, special tax inducements might be extended to cover the investments of industrial firms in research carried on by universities and non-profit institutions. This would bring industrial firms in closer contact with academic institutions and contribute toward a better balance of Federal and industrial sponsorship, he said.

# Headquarters

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# **Industry Speaks**

# New Materials for Industrial Use

Editors of forty-eight leading business and industrial magazines recently attended the "Trends of Electric Power in Industry" seminar, sponsored by Westinghouse Electric Corporation in Pittsburgh, Pa.

The following notations have been adapted from an excellent discussion on "The Influence of Materials on Future Design", presented by L. R. Hill, Assistant Manager, Materials Engineering Department of Westinghouse.

THERE are many new products available which have heretofore been only laboratory curiosities. These items will have a rather profound affect in the future on the design of many industrial and consumer items. Materials mentioned are not without faults—in many instances they require careful handling, new manufacturing techniques and intelligent application.

High Temperature Alloys—DISCALOY will literally "ring like a bell" at temperatures at which most ordinary steels are about as soft as butter. In gas turbine designs, DISCALOY permits operation at approximately 25 per cent greater stress or allows reduction in the weight of the turbine disc by 25 per cent. A gas turbine will barely turn over at 750 F, but as the temperature increases the efficiency and useful power output also rises. At temperatures of 1500 F, it is possible to build aviation power plants which are almost competitive with piston engines in efficiency and which have much greater specific power weight ratios.

Light-Weight, High-Strength Weight Ratio Metals & Alloys—Titanium, occupying an intermediate position between iron and magnesium is potentially a material having a higher strength weight ratio than any now known commercially. Molybdenum has just been fabricated in large sheets for commercial applications. Its properties are similar to those of tungsten but its density is less and its cost is much lower.

Titanium is much stronger than 75 ST aluminum and its strength-weight ratio is quite a bit higher than that of high strength 18-8 stainless steel. The gas turbine industry is particularly interested in titanium because of its superior performance at elevated temperature and its light weight.

Cast Iron—If ordinary gray cast iron is treated or "inoculated" just before casting with magnesium, the carbon content will appear as nodules having no connection from one nodule to the other. Ordinarily the carbon is distributed in long needlelike fashion. This improvement in arain structure means that we can now use this old

material in many applications which formerly required cast steel or even in some cases special forgings.

Ceramet-Metamics—Metal ceramics are made by combining such materials as aluminum oxide with cobalt, or other high melting metals by powdered metallurgical techniques. They are remotely related to sintered carbides but in most cases will withstand higher temperatures and show superior resistance to oxidation and general atmospheric attack.

Silicones—On high temperature motors operated under highly corrosive conditions and at maximum rated temperatures, the finish becomes of utmost importance. Silicones may be used to advantage. From the standpoint of thermal stability, the conventional resins are quite inferior to Silicones.

Silicones also have other desirable characteristics. The rate of change of viscosity with temperature is much less pronounced than it is for the petroleum oils, thus making it possible to operate a grease formulated from silicones at much lower and higher temperatures than is the case with the older materials. Silicones do not have high film strength, but in most cases it is possible to use them in such a fashion that adequate lubrication is achieved.

Molybdenum disulfide is a solid lubricant developed during the war which is rather stable with respect to temperature and seems to have a very high film strength. It will lubricate machines under conditions of load and temperature where even silicones fail badly. It also offers the possibility of producing machines which could be run for long periods of time if the normal lubrication system had foiled.

Photoelastic resins—These materials are special type of polyester copolymer which have a three dimensional network filled with high viscosity liquid. Product is available in sections up to 10-in. in diameter and 24-in. long. It can be used for model construction, stressed at an elevated temperature, cooled to room temperature while under stress, sectioned, and examined under polarized light.

Another recent development is INSULFOAM, a phenolic resin which has the property of expanding during polymerization and filling a cavity which is from 100 to 200 times the original volume of the resin. As thermal insulation it has the advantage over conventional products in that it can be shipped as a liquid in small containers and applied in places where it is almost impossible to pack mineral wool or similar materials.

These are a few of the interesting and significant material developments of the past 10 years as discussed by Mr. Hill of Westinghouse. Some of these materials, although now currently available, are going into military equipment and for this reason it may require more than the normal length of time before they find their way into many products for industrial use.

# GUY B. ARTHUR, JR.

President, Management Evaluation Services, Inc., Toccoa, Georgia

# Comments



There are hundreds of good ways to deal with people. The trick is to pick out the personnel techniques that will bring results—and then properly apply them.

N every plant or office there are many things being done well. This varies from plant to plant and from department to department. The good manager takes the really successful procedures from one situation and applies them, insofar as possible, throughout his organization. He recognizes the variables in human nature and does not push ideas down throats—nonetheless, he standardizes to a very great extent.

#### Production

Our production managers strive to find the best way of doing each job. As soon as they find a better way it is adopted on all similar operations. Much of this constant improvement results from trial and error. Some of it comes from the work of specialists who devote their time and energy to such research. The end result is the same—standardization or the consistent use of the best known methods.

To be specific—a manager learns that a certain cutting tool works best on the material he has to process. This tool does the job better, faster and cheaper. He then has all similar machining done with that cutting tool.

A few years ago many production men learned that palletizing of materials would save money. They tried it out in their own shops to be sure it would work as the materials handling men indicated. Now most large shops use pallets everywhere possible.

Unfortunately, this same use of the best methods has not been exploited to any extent in the field of human relations problems. Except in a few phases, managers have not adopted the best techniques being used in some parts of their own organization.

# Safety

One exception to this is found in the field of safety. In most industrial plants the mechanical causes of accidents have been studied. When it has been found that a certain guard or device would eliminate a hazard—that device has been used in all similar hazardous places. The frequency of accidents has been greatly

reduced as a result of thus applying the knowledge gained in one situation to all similar ones.

#### Communications

The question is—How can we use the same principle in other personnel management functions? Let us look at communications. There are many different media being used for getting and giving information. House organs, bulletin boards, sound systems, payroll inserts, through supervisors, letters to employees, grievance procedures, suggestion systems, the local press and radio are some of the most commonly used media. Some of these are doing the job of communications—others are not. Still most companies continue using most of them without determining their individual effectiveness.

It is possible to determine how much employees are really getting out of each of these media. With such factual knowledge the company can improve their communications. Better communications means more understanding and, in turn, a greater willingness to work. In most cases an analysis of the facts will enable a company to do a better job at a lower total cost.

# Benefit Plans

A critical area in the field of communications is in the understanding of benefit plans. If employees do not understand what they are getting in the way of benefits they cannot begin to appreciate them. Most companies do not capitalize on their ever-growing investment in benefit plans. It is possible to find out what employees know about each and every plan you are providing for them. From this you will know which plans need greater explanation.

In addition, you can determine from the information previously given employees regarding each plan—which type of presentation has been effective in selling such plans. Then you can apply your own successful techniques to those plans which need additional selling.

# **Supervisory Training**

Similarly, through the use of employee opinion surveys, it is possible to measure the adeptness of supervisors in handling employee relations. Employees will tell us whether or not they are treated fairly, how free they feel to discuss their problems, whether changes are explained

# on Personnel Techniques

to them, how secure they feel in their jobs, whether or not they are trained properly and many other things

that reflect directly on supervision.

Remember that most supervisors are anxious to do what is right as a means of maintaining their prestige. When confronted with facts, regarding their supervisory behavior, they will really work hard to improve. They become extremely interested in ways of improving their weaknesses when they realize these are known to top management.

# **Determining Training Needs**

Some things supervisors do are successful—others fail. The good manager, department head or superintendent sees that all of the successful techniques used by his subordinate supervisors are known to each of them. To do this he must first determine the strong and weak points of each of his subordinates. This can be done by going

to the employees for their opinions.

The weaknesses, as pointed up by employees, tell what type of training is needed. In addition, you know who needs the training and who doesn't. You no longer need to waste training time on unnecessary matters. Nor do you need to waste the time of all supervisors on conferences devoted to subjects which some of them already know very well. You now know what training is needed and who needs it.

# **Determining Good Techniques**

The next step, of course, is to determine what things your supervisors do that are good in the eyes of subordinates. Interviews or group discussion conferences with said supervisors will bring to light most of their good human relations approaches. The nice part of following this plan is that you learn what works in your own shop with your own people.

#### **Getting Action**

The last step is to get over to the weak supervisors those approaches which have been determined in the preceding paragraph. At this point you will notice a material difference in your audience as contrasted with

similar previous conferences.

These weak supervisors know wherein they are weak. They also know the boss knows of their shortcomings. They are interested and don't just sit through the meeting thinking that what you say applies to someone else. Discussions are much more lively. Changes in behavior are more frequent.

#### Results

As much as one hundred per cent improvement in supervision has been made in some companies as a result of following this plan. How do we know? Because employees have indicated this in their differences of opinion from one year to the next. More impressively because they have been more willing to work as shown by their greater output per man hour.

Let us review one case example having to do with favoritism—that great deterrent to greater productivity. The first year sixty per cent of the employees in most departments said their supervisors played favorites. Fifteen months later, following the program outlined above, only twenty per cent of the employees felt this way. Meanwhile productivity per man hour was up. Supervisors had learned to use many techniques to eliminate feelings of favoritism.

True, this was only one of twenty basic supervisory factors covered in that particular program. But in almost every case where employees had rated their supervisors down the first year great improvement was attained during the ensuing year and a quarter. Meanwhile only one supervisor was removed—the rest had been trained how to do a satisfactory human relations job while get-

ting out production.

The importance of this can only be appreciated when we recall that all we accomplish is through people. This means that unless our supervisors are adept at their job of getting results through people we cannot hope to be competitive in years to come.

# **Management Development**

Much has been said about supervisors being a part of management. It is commonly agreed in modern management circles that supervisors must be a part of the management team. All of this is fine but the payoff is not what top management thinks on the subject. What do the supervisors themselves think?

Many companies are getting the opinions of their lower levels of management on this subject. Do these fellows think they are a part of management? More important, why do they feel they are or are not a part

of the team?

The having of such facts enables top management to do a better job. They can use their strong points universally in all departments—since they now know these are effective in some departments. They can analyze those reasons why supervisors do not feel they are a part of management. From this analysis they know where to make the necessary corrections. It is obvious that such corrections will bring about better supervisory morale and in turn improved employee relations.

If you agree that we only get results through people then you must also go along with the idea that top management can only get results through their supervisors. That means good supervisory morale is essential to success in every business. Good supervisory morale, like employee morale, is not attained by speeches, booklets, pretty charts or fancy policies. Good morale exists only when the supervisors feel they are being treated fairly. They must sincerely believe that they are receiving all of the satisfactions due their position.

There is only one way to determine whether or not supervisors are a part of management. That is by going to them for their frank answers to questions on the

subject.



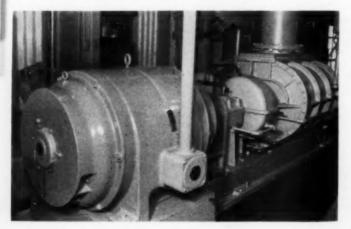
# **Dual Fuel Units in Texas Cement Plant**

# Halliburton Reports on First Six Months Operation

Halliburton's Corpus Christi plant uses four, two-cycle dual fuel units totaling 7,200 hp. Engines operate either as full diesels or on natural gas with oil as pilot fuel.

FOUR dual-fuel Fairbanks-Morse engines are rounding out their first year of service at the big new

plant of the Halliburton Portland Cement Company at Corpus Christi, Texas. Engineering personnel re-



port that it has been profitable to operate the engines and that the plant has not experienced a single shut-down due to engine failure.

The multi-million-dollar Halliburton mill has a capacity of 1,500,-000 barrels of portland cement a year and incorporates many unique design features. Though not the first to make cement from oyster shells, this is the first cement mill to grind oyster shell in closed circuit with rake and bowl-type classifiers. All raw materials—shell, clay, and bauxite and iron ore—are ground separately and stored as slurry in individual tanks to permit maximum flexibility in blending the product.

Scavenging air for each 2000 hp engine is supplied by Roots-Connersville rotary positive blowers driven by a Fairbanks-Morse motor. Air for each engine is drawn from outside the building through 16 element impingement-type filters in metal air houses. Exhaust gases vent through vertical silencers. Starting air is provided by a pair of vertical motor-driven compressors which keep four bottles at 250 psi.

Another unusual feature is the provision of duplicate equipment which not only insures continuity of production but makes it possible to operate two complete circuits independently. Thus, the plant can run at half capacity or produce two different cements simultaneously.

# **Processing Equipment**

Cement manufacture requires heavy, power-consuming equipment. The two primary grinders are 8 x 16 ft Allis-Chalmers ball mills driven by 450 hp Electric Machinery synchronous motors. A secondary mill for shell grinding takes another 450 hp motor. G.E. 100 hp motors turn the two 377 ft kilns and each kiln has two induced draft fans driven by 100 hp motors. Clinker is ground into cement in two 7 x 40 ft Allis-Chalmers 3-

compartment ball mills driven by 700 hp Electric Machinery synchronous motors. Cement is pumped to storage by two pumps driven by 150 hp EM motors and the pumps are served by two rotary compressors driven by 200 hp motors.

This obviously is but a fragmentary list of equipment. In all, it takes 5,600 hp to operate the plant at capacity, a load which can be carried by three engines with one 1,600 hp unit in reserve.

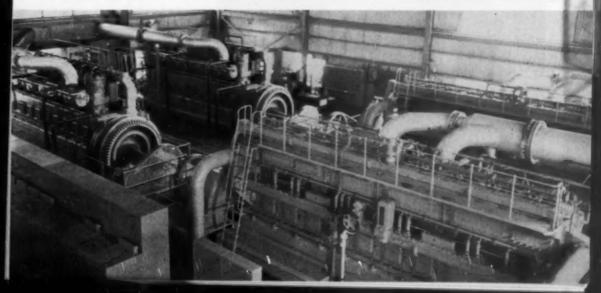
It is the practice in this plant to run engines at full load. Units in operation must run at an overload before the operator starts up another engine. Even the 5,600 hp requirement, however, is not the full story on power demand. Pieces of heavy machinery stop and start and the starts take lots of power. For example, the mills that grind clinker into cement each hold about 6,500 lb of 31/2-in. balls, 14,600 lb of 3-in, balls and 14,000 lb of 2-in. balls in the first compartment; 44,500 lb of 11/4-in. balls in the second compartment; and 61,800 lb of 7/8-in. Concavex media in the third compartment. There are no clutches and the 700 hp electric motor is started across the line, pulling an estimated 500 per cent overload. Works Manager A. J. Anderson reports that the big mill is usually started when the engines in operation are already fully loaded, yet they take the sudden surge of demand in stride.

This was one of the factors which influenced Halliburton to put in its own power plant. Economy was another big factor. Demand charges for purchased power were bound to be high. Initially, it would be

Cement manufacture requires heavy power-consuming equipment. The two primary grinders are 8 x 16 ft Allis-Chalmers ball mills driven by 450 hp Electric Machinery synchronous motors. These units handle the primary grinding of cyster shells and other raw materials.

All four engines are two-cycle Model 33FD16 Fairbanks-Morse dual-fuels of 16-in. bore and 20-in. stroke, developing rated horsepower at 300 rpm. Two prime movers at the left are 8-cylinder engines rated at 1,600 hp. Two at the right are 10 cylinder units rated at 2,000 hp. Larger engines drive 1,400 kw, 4160 v Fairbanks-Morse alternators; smaller engines turn 1,125 kw F-M alternators.





necessary to construct a big substation. Finally, natural gas is cheap in Texas and dual-fuel engines promised to generate power at competitive costs.

## Service Data

The four-engine plant first went into service in December 1949 and reached full production in 1950. producing at the rate of 25,000,000 kwh a year. The first six months for which complete operating figures are available are tabulated. In that six-month period from July through December 1950, the plant generated 12,775,700 kwh while consuming 139,977 MCF of natural gas and 94,227 gal of fuel oil. This represents an average consumption of 10.96 cu ft of gas per kwh. Pilot fuel supplied 7 per cent of the Btu's. The four units ran a combined total of 13,816 hours out of a possible 17,520. During this time, lubricating oil consumption totaled 5,422 gal, an average of 4,601 hp-hr per gal.

The engines can operate either as full diesels or on natural gas with oil as pilot fuel, and can be switched instantly from one fuel to the other. There have been several occasions when the gas supply failed and the engines automatically switched to fuel oil while running at full load. Gas reaches the plant at 50 to 60 lb pressure, is

# Six Months Operating Data (July-Dec., 1950)

Engine Hours Operated
#1—2000 hp ... 3,674
#2—1600 hp ... 3,310
#3—2000 hp ... 3,433
#4—1600 hp ... 3,399
Kwh Generated ... 12,775,700
Gas Used, MCF ... 139,977
Fuel Oil Used, Gal ... 94,227
Lubricating Oil, Gal ... 5,422

regulated to 56 lb by an orifice fitting, is metered, and then reduced to 17 lb in individual regulators for each engine. Fuel oil flows by gravity from storage to four 600 gal day tanks. Picked up by engine-driven supply pumps, the fuel is pumped through duplex filters to the special small-capacity injection pumps that handle the pilot oil.

#### Lubrication

A straight mineral oil is used for engine lubrication. Oil is circulated under pressure by built-in engine-driven pumps to the bearings and pistons and through a shell-and-tube oil cooler. Part of the oil is drawn from the crankcase continuously and put through a Fuller's earth purifier for each engine. Upper cylinders are supplied with lube by force-feed mechanical lubricators which are filled auto-

matically from the crankcase oil supply. Each engine has a motordriven auxiliary lube pump for use in starting and shutting down.

Each engine has a separate closed cooling water system with a motor-driven centrifugal pump circulating soft water through the engine jackets and a shell-and-tube heat exchanger. Jacket makeup water is treated in a zeolite softener. Nueces Bay, which adjoins the plant, provides an abundant supply of salt water for the raw circuit. The salt water is taken from the bay by three vertical turbine pumps, put through the exchangers and discharged to the bay. Jacket temperature is regulated by automatic thermostatic controls which bypass soft water around the exchangers.

The 1,600 hp units have built-in scavenging pumps. The 2,000 hp engines are supplied with scavenging air by motor-driven rotary positive blowers. Air for each engine is drawn from outside the building through 16-element impingement-type filters in metal air houses. Exhaust gases vent through vertical silencers. Starting air is provided by a pair of vertical motor-driven compressors which keep four bottles at 250 psi.

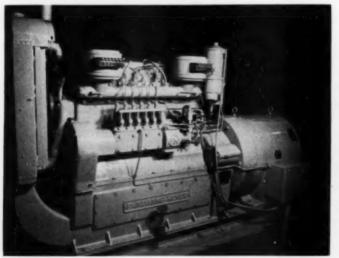
The power plant's main switchboard is of the all-enclosed, deadfront, unit type with electricallyoperated switchgear and particularly complete instrumentation. There is also a gauge panel beside each engine with an exhaust pyrometer, day tank level meter, gauges and alarms on lube and water pressure, and switches for engine auxiliaries.

# Standby

One piece of equipment that already has earned many times its price is a 6-cylinder Fairbanks-Morse diesel which turns an Electric Machinery synchronous generator at 1200 rpm to develop 30 kw. The most crucial piece of production machinery in the mill is the thickener on which the entire plant depends. The thickener must run constantly and, if power failure caused it to stop, the mill might be shut down for a prolonged period.

To insure an unfailing power supply, plant designers provided

This standby 30 kw Fairbanks-Morse diesel generator turns an Electric Machinery synchronous generator at 1200 rpm to develop 30 kw. It also provides power for lighting and engine auxiliaries.



three alternate sources: a special line to the nearby utility plant, the mill's own four-engine power plant, and finally the little diesel-generator set. If one source fails, an automatic device switches the thickener motor to the next source, and then, if necessary, to the third. On one occasion, lightning knocked out the transformers of both the utility and the big dual-fuels and it was the 30 kw generator that kept the thickener going.

This standby service is most important, but the diesel has other functions. It provides enough power to light the entire mill and operate starting air compressors and other engine auxiliaries when all the big engines are shut down.

There is evidence throughout the mill of Halliburton's determination to manufacture a fine product with maximum efficiency. In the power plant this is evidenced by the heavy-duty prime movers and their full complement of protective accessory equipment. It is an ex-

tremely attractive plant and its appearance reflects the pride of management and operating personnel. The engines are painted graygreen, foundations gray, and floors Spanish tile red. All piping and equipment is painted in accordance with a color code which not only enhances the appearance of the plant but facilitates quick identification and correction of trouble.

A preventive maintenance program is designed to keep the engines in peak condition. In the first year, no repairs were necessary.

#### Personnel

Management of Halliburton Portland Cement Co. is energetic, progressive and thoroughly experienced. Erle P. Halliburton is president; Ellroy King, vice-president, secretary and treasurer; Erle P. Halliburton, Jr., vice-president; A. J. Anderson, works manager; Keith Sandefer, chief engineer; H. R. Gingerich, chief chemist; and Marshall Clements, sales manager. Power plant superintendent is Herbert Bolt.

# Principal Equipment Engines: Two 2000 hp and two 1600 hp

Model 33FD16, 2-cycle, 300 rpm, dual-fuel engines. Fairbanks Morse & Co. Generators: Two 1400 kw and two 1125 kw, 3-phase, 60-cycle, .8 pf, 4160 volt alternars. Fairbanks Morse & Co. Blowers: Roots-Connersville Air-filters: Air-Maze Exhaust silencers: Maxim Lube oil: Gulf Security E Lube purifiers: Honan-Crane Oil coolers: Ross Auxiliary lube pumps: Roper Fuel filters: Nuge Gas regulators: Fisher Cooling water pumps: Fairbanks Morse & Heat exchangers: Ross Water softener: Fairbanks Morse & Co. Exhaust pyrometers: Alnor Levelmeters: Levelometer Corp. Fuel oil: Humble Oil Co. Natural gas: Houston Natural Gas Co. Switchboard: I.T.E. Switchboard instruments: General Electric Air compressors: Gardner-Denver Standby diesel: Six-cylinder, 1200 rpm, Model 48AG41/4, diesel generator set, Fair-banks Morse & Co.

# Halliburton Plant Field Trip Scheduled by Oil & Gas Division of A.S.M.E.

The Oil & Gas Power Division of The American Society of Mechanical Engineers will hold its 23rd annual conference and exhibit at the Baker Hotel, Dallas, Texas, June 25-29, 1951.

Many interesting discussions are scheduled, including papers by Ralph Miller, Albert C. Cavileer, Ralph L. Boyer and W. R. Crooks, J. N. Mac-Kendrick, George Bollman, C. A. Chamberlain, R. L. Leadbetter, and Howard E. Degler.

A feature of the program will be a panel discussion on "Gas-Engine Maintenance." Two sessions of the panel are scheduled. In the morning session, gas-engine maintenance will be explored from the point of view of operators. In the afternoon session, manufacturers representatives will take a look at the same subject.

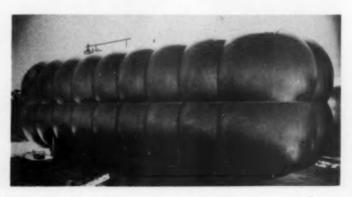
Friday of the conference is being set aside for a 12-hour field trip to two widely scattered Texas industrial plants utilizing internal combustion using Diesel engines. The inspection party will leave Dallas on a regular scheduled airliner for Corpus Christi, Texas, a distance of about 500 miles. There a two-hour inspection trip will be made of the Halliburton Cement Works. Of interest will be an 8000 hp Diesel installation and the manufacture of cement from sea shells.

The party will then fly to Victoria, Texas, a distance of 100 miles, where they will embark on buses for the Point Comfort Plant of the Aluminum Company of America, where they will inspect one of the largest installations in the world of internal combustion engines.

# Multisphere for Florida Plant

THIS 30,000-gallon Horton Multisphere was fabricated by the Birmingham, Alabama, shops of the Chicago Bridge & Iron Company for the Superior Dade Gas Corporation at Fort Lauderdale, Florida.

The 11 ft, 6-in. by 38 ft, 4-in. structure is designed for a working pressure of 250 psi. It will be used to store propane.





Coils of wire—approximate weight of this load is 2,200 lb—are picked up and moved from box car to scales for weighing by this 3,000 lb capacity battery-electric industrial truck equipped with ram.

Coils of wire are stacked in "laced" position in warehouse. Stacks are built to height higher than a man's head, a practice which permits greater storage of material on a given floor area, but one that was not economically feasible under manual methods that prevailed before the ram-truck was installed.

# **Cutting Costs with**

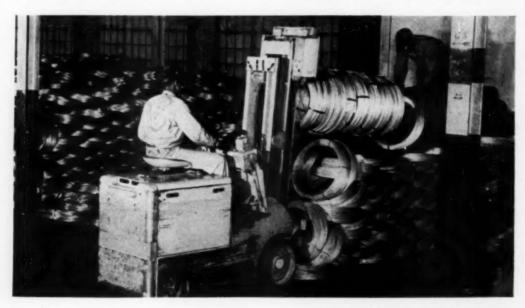
In the St. Louis plant of A. Leschen & Sons Rope Company unloading and warehousing a 12-ton load of wire coils now takes four men one hour where previously the same work performed entirely by manual means took six men 21/2 hours. Ram equipped fork truck is used in the work.

# **Coiled Wire Handling**

THESE brief case histories from industrial plants in St. Louis, Missouri, and Durham, North Carolina, show how the introduction of the fork truck method of handling can increase storage space and at the same time release valuable manpower for more profitable assignments in the plant.

In the St. Louis plant of A. Leschen & Sons Rope Company, the savings in man-hours in the receiving and warehousing operations are only a part of the benefits that have been realized since it placed the battery-electric ram-truck in operation.

There has been a faster movement of material, both on receipt and into process. Greater use is also made of previously unutilized warehouse space because the ram-truck can pile, or remove, loads at a height of as much as 86 in. from the floor.



# **Fork Trucks**

Tiering of hogsheads of tobacco in Liggett & Myers Tobacco Company Warehouses in and around Durham, N. C., has been a one-man job since the installation of the industrial fork truck method.

# **Tobacco Handling**

With the introduction of the fork truck method of handling hogsheads at the various warehouses of Liggett & Myers Tobacco Company near Durham, N. C., the work of placement in, or removal from, storage areas was simplified.

In storage, the hogsheads are tiered three-high in rows at right angles to the aisles. The bottom row rests on stringers instead of floor surface, thus providing air circulation around each unit. Layers above the first are separated by dunnage strips on which the hogsheads ride.

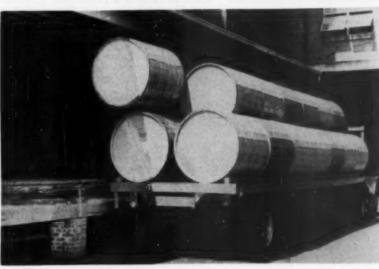
Tiering and detiering of the hogsheads in the warehouses have

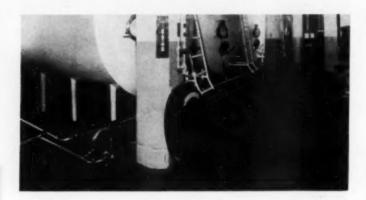
been speeded up and damage reduced. Damage had always been an expensive maintenance item but has now been reduced to a minimum.

Above. Operator with aid of helper, removes hogshead of aged tobacco from warehouse for shipment. Hogsheads are 54" in length and 46" in diameter and weigh approximately 1,100 lb.

Use of fork trucks has increased the loading of these trailers by 50 per cent, through ability to raise hogsheads and add the third row at the top.







By RAYMOND B. SEYMOUR
The Atlas Mineral Products Co.

Jointing materials for brick and tile floors must be completely resistant to the corrosive conditions encountered. This dairy floor is constructed of tile

joined with a carbon filled polyfurfuryl alcohol resin cement.

In the May issue we discussed the principal types of industrial floors. This Part 2 lists available jointing materials and discusses their respective merits.

SOME of the previously-discussed materials, such as Portland cement, aluminite cement and admixtures, are used to join brick and tile and are certainly satisfactory providing they are completely resistant to the corrosive conditions encountered.

However, in too many cases, compositions known to be non-resistant in bulk, are used in joints on the assumption that the attack will be less in a thin joint. A visit to any food processing plant using bricks joined with non-resistant materials will prove the fallacy of this philosophy. Sometimes the attack by the food acids cannot be seen but the odors coming from such joints are easily detected. As a result, federal, state and local health authorities, who have insisted on high standards of sanitation in food processing plants, have not condoned the use of non-resistant materials in brick and tile joints.

Where corrosives are not encountered, Portland cement is definitely an adequate material for jointing brick and tile. It has a tensile strength of 280-385 psi and a compressive strength of 8,000-10,000 psi as well as adequate adhesion to wire cut brick or tile surfaces. However, Portland cement and its admixtures cannot be used satisfactorily in dairies, breweries or other food plants where exposure to milk, fruit acids, beer or greases is encountered.

### Silicate Cements

Silicate cements are the oldest corrosion resistant cements known and are seldom used in modern floor construction. This type of cement is available as proprietary compositions that set by evaporation or by chemical reaction. The former type are still used to some extent to join brick in tower construction but are not advocated in any case for floors.

Chemical setting silicate must be used for extremely hot nitric or chromic acids but are com-

pletely unsatisfactory in the presence of water or alkalies. These cements are usually prepared by mixing approximately two parts by weight of a powder containing the setting agent with one part by weight of a special liquid based on sodium silicate. The working and hardening time of these mortars depends upon the temperature but it is customary to expect a working time of 45 min and a hardening time of 24 hrs at 70 F. When completely set, the cements have excellent adhesion to wire-cut brick, good physical strength and a coefficient of expansion of 6.2 x 10-6 in. per degree F and a density of 120 lb/cu ft. Approximately 360 lb of silicate cement mortar are required for 100 sq ft of floor with 1/4" joints using 8 x 31/4 x 41/2" brick laid on a silicate cement bed with the depth of the brick being 334".

## **Hot-Melt Cements**

Cements based on asphalt, coal tar, and meltable plastics are usable in certain instances where the corrosion resistance of these materials are adequate for the service encountered. They, of course, are not suitable for high temperature service.

The most widely used hotpoured jointing material is based on a plasticized sulfur composition. This composition is satisfactory for most acids but is not suitable for solvents, greases and strong alkalies. This proprietary composition is available as 5 lb ingots which are broken, melted and poured at a temperature of 265-290 F. The product may be used with or without a bed. When the latter is required, the floor is constructed by setting each brick or tile on three 1/4" chips of the sulfur cement so that a 1/4" bed is formed when the hot sulfur composition is poured.

Brick or tile joined with sulfur cement is ready for service within a few moments after construction. This product has good adhesion to wire-cut brick and tensile and compressive strengths greater than 500 and 5,000 psi respectively. Quality sulfur cements usually have a water absorption of less than 0.5 per cent and a density of 135-140 lb/cu ft. They cannot be used for temperatures above 200 F since at that temperature there is a change in the crystalline form of sulfur which would destroy the joint. Approximately 800 lb of sulfur jointing material is required for 100 sq ft of surface with a joint 34" wide and 3¾" deep using an 8 x 4½ x 3¾" brick with a bed. If a bed is not used, the material requirement is reduced to approximately 440 lb per 100 sq ft under the same conditions.

# Phenolic Cements

Phenolic cements which have been available in this country for almost twenty years have given excellent service in brick and tile floors. These products are completely resistant to most acids and solvents but are decomposed by strong alkalies (6). The phenolic cement mortar for jointing brick and tile is usually prepared by mixing two parts of a carbon powder containing an acid catalyst with one part by weight of a phenolic liquid resin. Such mortars have a working time of about 60 min and a hardening time of about 15 hrs at 70 F. These periods of time decrease rapidly as the temperature is raised. When

the jointing material is completely set, it is resistant to almost all acids at temperatures up to 360 F. While it is not advocated for concentrated sulfuric acid or strong solutions of nitric or chromic acids, it has given adequate service in the presence of these materials in many instances.

Carbon - filled phenolic cements have excellent adhesion to wirecut brick and have a tensile and compressive strength of greater than 1,000 and 10,000 psi respectively. These products have a coefficient of expansion of approximately 6.4 x 10-6 in. per degree F and a density of 90 lb/cu ft. Approximately 375 lb of carbonfilled phenolic resin cement is required for joints 14" wide and 334" deep for 100 sq ft of floor using 8 x 41/4 x 33/4" bricks with a bed. About 100 lb less cement is required for the same size joint without the bed and, of course, thinner joints also require less material. Thin joints can be obtained quite readily when the brick is buttered but if the material is grouted in, it is essential that wide joints be used.

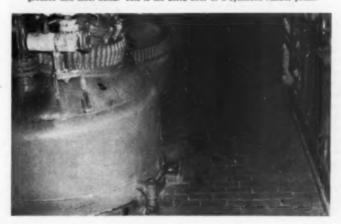
# Furfuryl Alcohol Polymer

The development of furfuryl alcohol polymer cements some ten years ago (10) has provided the construction engineer with a jointing material for brick and tile that is completely resistant to all alkalies, solvents, greases and most acids. These cements have found considerable use in floors for a large number af industries (7, 8, 11).

Furfuryl alcohol polymer cements are usually prepared by mixing approximately two parts by weight of a carbon powder containing an acid catalyst with approximately one part by weight of a partially polymerized furfuryl alcohol liquid resin. The working and hardening times of the most widely used proprietary furfuryl alcohol cement are one hour and twenty hours respectively at 70 F. When completely set, such cement has a water absorption of less than 0.4 per cent and a tensile and compressive strength of greater than 1,250 and 10,000 psi respectively. It has excellent adhesion to brick, a density of 90 lb/cu ft and a coefficient of expansion of 6 x 10-6 in. per degree F. Approximately 375 lb of this cement is required for a joint 14" wide and 3%4" deep for 100 sq ft of floor surface using an 8 x 41/2 x 33/4" brick with a bed. As in the case of phenolic cements, less materials are required for thinner joints and if the bed is omitted.

As a result of continuous experimentation by one of the leading manufacturers of resinous cements, a large number of new materials have been developed and are now under test in specific industries. It can be expected that some of these will find specialized uses in services such as sodium

Furfuryl alcohol polymer cements provide the engineer with a jointing material for brick and tile that is completely resistant to all alkalies, solvents, greases and most acids. This is the brick floor of a synthetic rubber plant.





The tile floor in this jelly plant was joined with a carbon filled polyfurfuryl alcohol type cement. Illustrations courtesy of the Atlas Mineral Products Co., Meriztown, Penna.

hypochlorite and chlorine dioxide where standard commercially available cements have proved inadequate.

As a result of resourcefulness and technical know-how based on many years of experience, it is possible for the leading manufacturers of corrosion resistant cements to supply or develop a specific cement for almost any use. For example, a recent request was made for a cement having a resistance between 25,000 and 500,000 ohms as measured between ground connection and an electrode placed three feet apart at any point in the floor. This requirement was based on specifications for hospital floors in order to reduce the possibility of electrostatic spark discharges and subsequent ingnition of inflammable gases in operating rooms. In this instance, it was possible to select one of the thousand experimental cements from the shelf. As would be expected, this cement met the conductivity test and is now available commercially. Conductive floors for explosives manufacture have also been developed.

#### **Construction Methods**

Most of the methods to be described will usually apply for any hot-melt type or mortar cement. In all cases, a suitable membrane as previously described must be first applied.

## **Hot-Melt Cements**

Hot-melt cements may be used with either extra heavy, heavy or light duty floors. They have been advocated for food plant tile floors but should not be considered since no known hot-melt material meets temperature requirements used in modern sterilization techniques and few hot-melt type cements are resistant to highly alkaline detergents used for cleaning. When a bed is required, each brick or tile is set on three 14" thick spacing chips and then the molten composition is poured from small cans with the side pinched to form a "V" pouring spout. It is essential to use several pours. The first pour should come within 1/4" of the top and subsequent pours should follow within a few minutes of each other. The last pour should form a solid joint at least 1/16" above the suface of the tile. The time interval between pours should be long enough to allow the original material to settle in the joints and yet short enough to permit the second pour to become bonded to the previously poured warm joint. Excess cement may be chipped off and re-used. However, it is preferred to let the excess cement wear off with time.

# Application of Mortar Cements By Bricklayers' Methods

When mortar cements are used, it is essential that a minimum temperature of 70 F be provided and that no adulterants or foreign materials, such as water or Portland cement be allowed to come in contact with the resin cement mortar before it is completely hard. Also, all metal drains, exposed concrete, etc. must be coated with a suitable primer so that the mortar does not come in direct contact with these materials.

A thin layer of resin mortar is spread on top of the previously described membrane and the contact vertical edges of the brick or tile are buttered using a brick-layer's trowel and the buttered brick is bedded directly in the mortar. As other bricks are laid away from one wall, the bricks are pressed to the desired level and squeezed together in order to obtain joints approximately ½" wide or less. Excess mortar squeezed from the joints may be removed and reused.

Because of variation in brick or tile, it may be necessary to use joints wider than 1/8" in order to obtain continuous straight line joints. In such cases, quantities of cement in addition to that previously estimated must be used to make up for variations in the size of the brick and tile. The completed joints must be allowed to remain at a temperature of at least 70 F until they are completely hard and in all cases, water, solvents, and foreign matter must not be allowed to come in contact with the joints until they are thoroughly set. Most difficulties encountered in this type of construction are associated with attempts to put the floor in service before it is ready. Sometimes the service merely involves the foot traffic of onlookers or other trades but occasionally it involves a placement of machinery which too often is dragged across the bare floor without the use of planks.

As previously described in the

case of bricklayer methods, all metal drains, concrete, etc. must be coated with a suitable primer which is allowed to dry before laying the tile. The floor area must be at a temperature of at least 70 F until the mortar is completely set and no foreign materials or adulterants, such as Portland cement, plaster or water should be allowed to come in contact with the mortar until it is thoroughly hard.

Properly mixed mortar is spread approximately ½" thick on the previously described membrane using a trowel and clean, dry acid-proof tile is bedded into this mortar leaving open joints averaging about ¼" in widths between the tile. This technique is well known by tilesetters. The main difference being that a resin cement mortar rather than Portland cement is used and, of course, more than usual precautions must be taken to prevent contamination by foreign materials.

After the resin mortar has set to its initial hardness, additional freshly mixed resin mortar is troweled into the open vertical joints. A putty knife or similar instrument is run through the full length of the joint to remove entrapped air and the joint is then again filled level. When the resin cement begins to get some body and becomes like dough, the excess material on top of the tile is removed by rubbing with a damp burlap cloth using a circular motion and making sure that no material is dragged out of the joints.

All joints are examined the next day to make sure that they are hard. Any low joints are filled and, of course, if the cement is not hard, the temperature, method of mixing and possible presence of contaminents are checked to determine the error. Low temperatures will cause the setting time to be extraordinarily long and the addition of as little as one half of 1% of Portland cement will prevent the resin cement from ever setting.

A monolithic joint is obtained when new mortar is added to thoroughly set mortar, providing the surface of the joint has not been contaminated by Portland cement or water. Resinous cements are usually based on an acid-catalyzed reaction and will not set in the presence of Portland cement, plaster or other adulterants. It is important to point out that all excess resin cement must be removed from the surface of the tile while it is soft, otherwise, it can be removed only by grinding.

In some instances, neat cement is used for the bedding of the tile as is customary for tilesetting with Portland cement. In this case, it is of extreme importance to ascertain that there is no neat cement or Portland cement mortar in the vertical joint and that the resin cement joint is at least 34" deep. Tilesetters are usually more anxious to secure proper levels than to ascertain that no Portland cement gets into the vertical joints. As a result, they continually beat the tile until the vertical joints are practically full with Portland cement and then there is no room for the resinous cement joint unless the fresh Portland cement mortar is removed mechanically. In such cases, it is almost impossible to prevent contamination of the resin cement and as previously stated, will not set in the presence of even small amounts of Portland cement. Tilesetters who are not accustomed to

using resin cement have found it advantageous to sublet the contract for membrane laying and grouting-in of the resin cement to a contractor specializing in this type of construction.

#### Conclusions

Adequate industrial floors are now available to take care of almost any condition which may exist in a manufacturing plant. The materials of construction are fairly well established and providing such are purchased from reputable manufacturers, the product will be uniform and will do the job. In such cases, the most important part of the floor is the workmanship. It is essential to secure properly instructed skilled mechanics who will take a pride in their work and have some understanding of what they are doing. A poorly designed or poorly constructed floor is unsightly and expensive. With modern technology, there is no reason for a food plant, textile mill or chemical plant floor to be anything but the

The author appreciates the assistance of J. D. Fenstermacher in the preparation of these discussions.

# Television in Industry Wired television watches

pouring of molten steel



UTILISCOPE camera (upper left of upper picture) is focused down on stream of molten steel as it pours into mold for continuous casting of steel billets.

Lower picture shows operator, 50 ft away and out of heat and danger, watching the process on the screen so that he can closely control this critical pouring operation. Camera and viewing screen are connected by coaxial cable.

"Utiliscope," made by Diamond Power Specialty Corp., Lancaster, Ohio, is widely used in industry for greater safety, lower costs and improved quality.

# Instrumentation for the Plant Engineer

# **Measurement and Control of**

By E. A. MURPHY, Brown Instruments Division, Minneapolis-Honeywell Regulator Co.

THE advantages and basic operating principles of the potentiometer as an industrial measuring instrument were covered in considerable detail in Part 5, which dealt with mechanical potentiometers. The advantages were great accuracy and sensitivity and the fact that the instrument could be located a considerable distance from the point of measurement without adversely affecting its accuracy or its sensitivity.

Among the several inherent disadvantages of the mechanical potentiometer were cyclic or intermittent rather than continuous This is the 6th in a series of SP&I articles dealing with variables commonly encountered in the industrial plant and the principal means available for measurement and control.

measurement; the use of a rather delicate galvanometer; and a multiplicity of finely machined moving parts. These factors contributed toward a considerable amount of maintenance and made it necessary to provide shockproof mountings when the instrument was located in the vicinity of severe vibration.

The electronic potentiometer

was developed in order to provide an instrument which would not only retain the high degree of accuracy and sensitivity associated with potentiometric measurement, but also be free of the disadvantages previously listed.

# **Advantages and Limitations**

In general, most people regard accuracy and sensitivity as the

# **Operating Principles**

The basic circuit arrangement of an electronic potentiometer is essentially the same as that employed in its mechanical counterpart, and performs the same function, i.e. it balances the unknown millivoltage from thermocouple or other sensing element, against a known voltage from a source within the instrument.

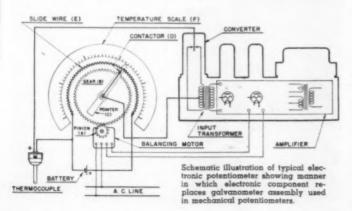
In the electronic instrument, how-

ever, the galvanometer assembly and the mechanical "feeling" or detecting mechanism are eliminated and replaced by a compact electronic unit which performs continuously the same function that the many moving parts in the mechanical potentiometer performed periodically.

As illustrated, the electrical bridge unbalance (which, in the case of the mechanical potentiometer, caused a galvanometer pointer to deflect) is amplified electronically and utilized to control the speed and direction of a balancing motor. This motor is positively connected to both the slidewire contactor, and the instrument pen and pointer.

Operation is as follows: a change in the temperature sensed by the thermocouple causes a change in the millivoltage produced by the thermocouple. This change unbalances the potentiometer bridge electrically, and the amount of unbalance is immediately amplified electronically and fed to the balancing motor whose speed and direction of rotation it controls. The motor moves the slidewire in a direction to rebalance the bridge, and at the same time moves the instrument pen and pointer. All movement stops, and the instrument indicates and records the new temperature, as soon as a condition of electrical bridge rebalance is achieved.

Since the bridge unbalance is detected electrically and amplified electronically, it is evident that any change in the measured variable will result in practically instantaneous movement of the balancing motor, and consequently of the instrument pen and pointer. Both indication and record of the measured variable are continuous rather than periodic.



# **Process Variables-Part 6**

# **Electronic Potentiometers**

Electronic potentiometers, having a high degree of accuracy and sensitivity, are free of the inherent disadvantages of mechanical potentiometers noted in the April issue of SP&I.

main advantages of the electronic potentiometer. This is probably true because a large number of these instruments are employed for highly exacting laboratory and research work. They are found working in conjunction with polarographs, ultraviolet spectrophotometers, and similar pieces of equipment wherein exceptionally high standards of accuracy and sensitivity must be met.

Industry in general—and the heavy industries in particular—actually have no need for such high accuracy and sensitivity, and, to the average plant operating man, other advantages are of far greater importance. Among these advantages are: flexibility, ruggedness, ease of maintenance, and reliability.

## Flexibility

Electronic instruments manifest their flexibility in two ways. In the first place, they are capable of measuring practically any variable when changes in that variable can be translated into changes in electrical quantities. For this reason, they are employed in the measurement of such variables as temperature, pressure, flow, speed,

Freedom from delicate moving parts is responsible for the ruggedness of the electronic instrument. Since it employs no delicately balanced galvanometer assembly, the instrument is unaffected by the vibration encountered even under the most severe industrial operating conditions. Here is a battery of electronic potentiometers mounted aboard a diesel freight locomotive to record data during test runs.

pH, conductivity, and many others. They are equally at home measuring open hearth roof temperatures in a steel mill, or recording generator output in a central station. Minor changes in the measuring circuit of the standard electronic instrument adapt it for use in the

measurement of these widely assorted variables.

In the field of temperature measurement alone, the instrument can handle temperatures extending from those approaching absolute zero (utilizing special resistance bulbs and thermocouples) to those in the neighborhood of 7,000 F (using a radiation sensing element).

Another aspect of the flexibility of this instrument is that electrical conductors connect it to the primary measuring element (ther-



mocouple, resistance bulb, etc.). This greatly simplifies the design of centralized recorder panels located appreciable distances from the various points of measurement, since it is not necessary to run any piping or capillary tubing to the panel.

The electronic instrument also manifests flexibility in its ability to provide multiple temperature measurement. A single strip chart recorder, for example, can plot on one chart curves of as many as sixteen temperatures sensed by thermocouples or resistance bulbs mounted in sixteen different locations.

#### Minimum Down-time

Another point, often responsible for the selection of an electronic potentiometer rather than a pressure-type thermometer for a temperature measuring application, is that with the former instrument the primary sensing element (thermocouple resistance bulb, etc.) is physically divorced from the measuring instrument and connected to it by means of electrical conductors.

In the case of thermometer, the temperature sensitive bulb, the connecting capillary tubing to the instrument, and the measuring spiral or helix in the instrument comprise an integral thermal system which is filled under pressure at the factory.

Obviously, any damage to a thermometer bulb or capillary tubing necessitates removal of the entire thermal system which must be returned to the instrument manufacturer for repair. The instrument will be inoperative until the thermal system is returned. Even if spare thermal systems are carried in plant maintenance stock, the replacement of an entire system is a sizable maintenance job.

In contrast to this, damage to a primary sensing element, or to the electrical conductors connecting it to an electronic instrument, presents a minor service problem, Replacement of a thermocouple or resistance bulb, for example, can be accomplished in a matter of minutes, rather than hours as would be the case if an entire thermal system had to be replaced. Instrument down-time is therefore reduced to a minimum. Moreover, the stocking of spare thermocouples or resistance bulbs ties up considerably less plant capital than would the stocking of a comparable number of thermal systems.

Concerning the electronic instrument itself, about the only parts that occasionally need replacing are the tubes in the electronic amplifier unit, and the standard dry cell battery that supplies the known voltage to the potentiometer bridge circuit. When the instrument is used with a resistance bulb, no battery is required.

# Reliability

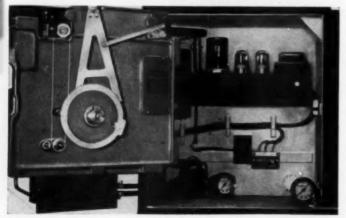
Reliability is achieved as the net result of all the advantages previously listed. Take an application where an instrument is to be employed as an automatic controller at one phase of a continuous process. Let us assume that it is desirable to mount this instrument on a master control panel some distance from the point of measurement and that considerable vibration is present. Since the instrument is a controller and since instrument failure would cause shut down of the entire process, reliability is a must.

The electronic potentiometer fulfills al; the requirements. It is unaffected by vibration; the use of flexible electrical conductors makes it a simple matter to mount it on the main panel, away from the point of measurement; servicing, i.e. lubricating and the checking and, if necessary, replacement of tubes and battery can be performed quickly; and replacement of the primary sensing element can be effected rapidly and without disturbing the instrument.

About the only point that can be listed as a limitation as far as the electronic instrument is concerned is its initial cost which is considerably greater than that of a recording thermometer. Even this limitation fails to hold true under certain conditions. For example, the cost of a mercury actuated recording thermometer depends on the distance between the point of measurement and the location of the instrument. This is true, of course, because the greater the distance between the bulb and the instrument, the more capillary tubing is required. Under extreme conditions, it is even possible for the cost of a mercury actuated thermometer to practically equal that of a thermocouple actuated electronic potentiometer.

Ordinarily, however, it is safe to assume that the first cost of an electronic instrument will exceed

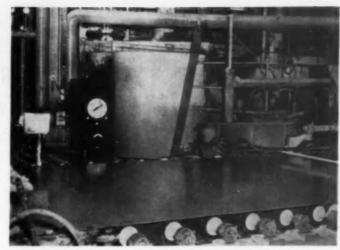
Ease of maintenance is an advantage stemming from the elimination of a large number of moving parts. This view of a typical electronic potentiometer with door open and chassis swung out shows how few moving parts there really are. Mounted in the rear of the case is the electronic component which replaces the galvanometer and many of the moving parts required in a mechanical potentiometer. Balancing and chart drive motors, slidewire and the few moving parts used are all mounted on the chassis.



that of a recording thermometer. On those applications where the temperature involved falls within the range of a pressure type thermometer, and where the accuracy, sensitivity, and speed of response of this instrument are adequate, the decision to use an electronic potentiometer should be made only after carefully evaluating the importance of the other advantages which this instrument offers.

Every measuring or control problem should be individually considered and analyzed to determine the exact instrument requirements. In making this analysis, the following factors should be considered:

- 1. What degrees of accuracy and sensitivity are called for?
- If temperature is being measured, what is the temperature range involved?
- 3. Will the instrument be close to or remote from the point of measurement?
- 4. Should the instrument be an indicator, a recorder, or an indicating and/or recording controller?
- 5. Would it be advantageous to have records of a variable (such as temperature or pH) which is being measured at several different loca-



Electronic controller automatically regulating pH of stock flowing to a Fourdrinier paper machine in the Newton Falls Paper Company, Instrument is unaffected by the considerable vibration encountered in this industrial operation.

tions, centralized on a single chart?

- 6. Is severe vibration present at the place where the instrument will be mounted?
- If the instrument is to be an automatic controller, is the process on which it is going to be applied of the

batch or continuous type? (If the process is continuous, reliable, trouble-free instrument operation is a "must" and excessive instrument down-time can not be tolerated.)

8. Is the use of a centralized or master control panel contemplated?

# American Engineering Mobile Display Completes Southeastern Tour

Stops in Charlotte, North Carolina and Atlanta, Georgia completed the current Southeastern trip of the American Engineering Company's mobile stoker display.

View at the left shows the exhibit in Charlotte. Roy A. Stipp of Greenville, S. C., American Engineering's stoker representative in North and South Carolina is shown at the left. G. H. Murphy, engineering and operating department of American's home office in Philadelphia is emphasizing operational procedures to the superintendent and engineer of a Southern mill. Accompanying the exhibit to Atlanta were C. W. Baldwin, district manager, power plant division; Ralph Davis, sales manager; and G. W. Murphy, all of the Philadelphia office; and Jim Nichols, Southeastern representative for American in Atlanta.

#### Power and Industrial Engineers See Mobile Stoker in Full Operation



# Maintenance of

# Step Type Voltage Regulators and Regulating Transformers

Since power transformer maintenance is a routine job to most readers, this article deals largely with those parts that are peculiar to the voltage regulator—tap changer core and coils, mechanism, and associated control.

W. E. KORSAN Allis-Chalmers Mfg. Co.

STEP voltage regulators are—
essentially transformers—
essentially transformers with fixed taps. As such, their maintenance is not difficult or complicated, nor do significant variations in principle of operation occur between manufacturers. The differences are in the mechanical and electrical construction used to change from one tap to the other. It is usually done automatically, maintaining a fixed output voltage either at the regulator or at some predetermined point between the unit and the load or loads supplied.

Step type feeder voltage regulators are not only transformers, they are auto-transformers, and by industry standards are limited to 2500 regulating kva maximum. Larger sizes are called regulating transformers. Power transformers of two, three, or four windings with equipment for changing taps when energized (or carrying load) are called load ratio control transformers. The latter are also commonly known as tap changing under load (TCUL) transformers.

Since transformer maintenance is a routine job to most readers, this article will deal with the tap changer core and coils, mechanism, and associated control. And, since single phase units present all the problems the three phase units do, except for physical size and interphase insulation, reference will be pricipally to them.

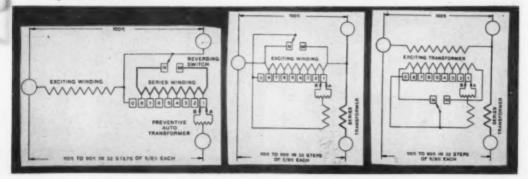
### Circuit construction

The tap changer must break the circuit and make it again on the

next tap quickly and repeatedly over many years of operation. Any interrupting device has its voltage and current limitations. For cost reasons various sizes and circuits and associated equipment are used. Check your nameplate to determine the circuit used in your unit. Figures 1a, 1b, and 1c, show some of the variations used in tapchanging circuits. In some ratings all the circuit interruption is done on one set of contacts as shown in Figure 2.

Now let's look at the regulator itself. Regulators of any type must be on neutral position before closing or opening by-pass switches when energizing or de-energizing to prevent possible serious damage to windings due to high circulating current in the circuit.

Fig. 1. Regulator Connection diagrams. 1A, Left. Single core type—used for majority of units. 1B, Center. Two cores and series transformer—used in larger units with voltage below 15 kv to reduce current handled by tap-changing mechanism. 1C, Right. Two cores and four windings—used in units above 15 kv to insulate tap-changing mechanism from line.



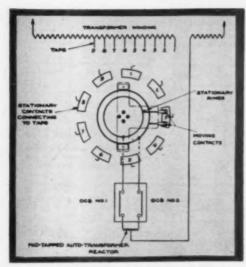


Fig. 2. The same basic principles apply to high-power control. Equipment, however, is more rugged and separate breakers are used to interrupt the current.



Fig. 3. Manual operation of the tap-changing mechanism on a single phase feeder voltage regulator is illustrated. Note accessibility of controls.

The regulator may be a station type (Figures 3 and 4) or designed for pole mounting (Figure 5). Operating power source for both control and tap changer motor will be self contained. From Figure 6 note that some regulators carry a wide range of separate voltage ratings and it is essential that the control circuit be connected for the actual voltage of the system being regulated. If no power gets to the control, check fuses. If low control voltage is present check fuse clip pressure. (Loose clips caused this writer nearly four hours excessive perspiration in his first service job.

The voltage control relay should then be carefully checked both for alignment and to assure proper clearance between upper and lower stationary contacts (one may be adjustable). Note that this item may either use holding coils which cause instantaneous operation of the tap changer on even momentary line voltage fluctuations or like the one illustrated in Figure 6 may be of the low energy balancing type. The latter, upon contact energizes a voltage integrator or time delay device which does not permit an initial tap changer operation until the voltage change persists for an adjustable time

period—generally 5 to 45 seconds. Either type of circuit should be run through its entire range on manual control to insure limit switches operating to stop tap changer at maximum buck and boost positions.

The voltage integrator motor should have a few drops of oil added to its main bearings twice a year. The voltage integrator is factory assembled and tested and

Fig. 4. Typical 3 phase regulator.



should not be tampered with. If repairs are needed, the manufacturer should be consulted about replacement if it does not operate in accordance with time delay settings. With other type circuits the holding coils and contactors should be checked regularly.

# Tap changer mechanism

Some regulating transformers and regulators have the tap

Fig. 5. Typical pole mounted regulator.



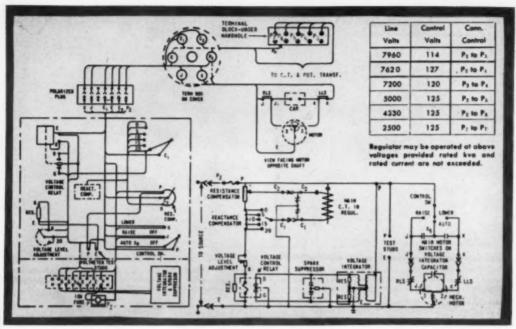


Fig. 6. Typical control diagram for regulator.

changer driving motor located outside the tap changing compartment. For such installations ordinary lubrication, testing, and inspection of motor, as well as of the associated chain or gear drive, should be established as routine. Keep the drive shaft stuffing box tight to eliminate oil leakage through the tank wall.

The tap changer and compartment for a 3 phase unit is shown in Figure 7. Note that here the driving motor is inside the compartment, below oil level, and requires no lubrication. Most manufacturers using this construction furnish a motor which can be stalled continuously without being damaged. Like single phase regulators it is designed for quick break but will operate with slow break if drive spring fails.

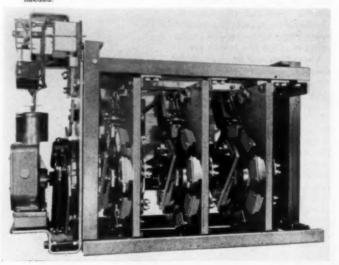
For minor inspection, the mechanism can be seen and reached through the large opening in regulator top without draining oil. For major work the unit must be untanked. For 3 phase regulators the entire mechanism is exposed by removing side cover after draining oil. from compartment. All parts

changer driving motor located out-- are then accessible, and may be side the tap changing compart- thoroughly inspected and repaired.

#### Compartment inspection

For inspection or repair of transformer core and coils untanking is required. Some 3 phase regulators have transformer and tap changer independently mounted and it is necessary to undo all bolted connections between them before untanking. Others rated

Fig. 7. Side view of shock-absorbing quick break tap changing mechanism for 3 phase regulator. This mechanism operates under oil and requires only inspection. Lubrication is never required and normally no adjustments are



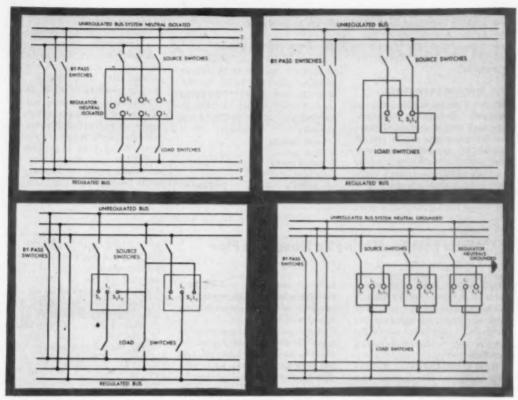


Fig. 8A. Upper left. Connection of one three phase regulator on a three phase ungrounded system.

Fig. 8C. Lower left. Connection of two single phase regulators in open delta on a three phase, ungrounded line.

Fig. 8B. Upper right. Connection of one single phase regulator on single phase line.

Fig. 8D, Lower right. Connection of three single phase regulators in Wye on a three phase, grounded neutral system.

less than 2500 kva and 15 kv, and practically all single phase regulators, are unit or cover suspended and both transformer and tap changer untank together without undoing any connections except those at control circuit terminal blocks.

Oil level and dielectric strength should be checked regularly exactly as for transformers. If either transformer or tap changer compartment oil tests below 22 kv, arrangement should be made to filter (or replace) immediately. The design of a regulator may or may not allow oil interchange between the compartments, but years of field experience indicate very little difference, if any, in oil deterioration tests for either construction.

Insulation board, after immersion in oil for several months has a tendency to shrink causing bolted connections to loosen somewhat. After the first year and preferably every several years thereafter deenergize and open up each unit to check tightness of all bolted connections, especially those on insulation board.

At this same time, inspect all contacts—movable and stationary—on dial switch, reversing switch, and slip rings (also separate interrupting switch, if used). Also check latches, and pins for roughness and wear. This can be done by hand through top access in cover without lowering oil level if desired for routine inspection in field. Bear in mind that excessive

wear can be the result of unnecessarily frequent operation on rapidly fluctuating voltages. If adjustable time delay is furnished, changing setting towards maximum time delay will greatly reduce number of operations with but negligible effect on regulated voltage output.

### Circuit connections

During a maintenance period is often a good time to check the manner in which the protective equipment is connected into the circuit. Check the by-pass disconnects as well as by-pass arrestors. Remember that regulator by-pass arrestors limit the voltage across the series winding only; they offer no protection from winding to

ground. For line surge protection from winding to ground, use valve type lightning arrestors between each phase wire and regulator tank ground as close to regulator as possible.

# **External connections**

Figure 8 shows various external regulator connection diagrams. Note that the recommended practice for grounding is: If system neutral is grounded, regulator bank neutral should be grounded; if system neutral is isolated, regulator bank neutral should be isolated. Do not confuse this with

tank grounding as the tank should always be grounded.

# Keep record straight

Records made in any good maintenance program ought to include anything unusual noted in the above routine. In addition checks (and records) should be made to see that none of the following are present.

- 1. Loose gaskets
- 2. Tank leaks
- 3. Rusted areas
- 4. Chipped bushings
- Unusually high or low readings of operation counter

- 6. Excessive readings of drag pointer or thermometer
- 7. Binding during hand operation of tap changer

If the answer is "Yes" to any of these points, you should make the answer "No" as quickly as possible by repairing or adjusting.

Following the various suggestions given here and in the manufacturer's detailed instructions should result in long and satisfactory life of your regulators. If trouble is encountered you can materially assist the manufacturer by telling him your maintenance findings.

# Metal Post for Making Up Flanges on Pipe

PIPE fitters have experienced trouble from time to time in making up flanges on pipe. The chief trouble is in screwing the flange on to the pipe, where the pipe cannot be fastened into a pipe vise.

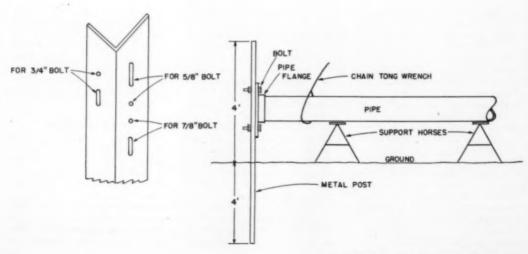
For a number of years we have been using an arrangement that employs a piece of 4" x 6" x ½" angle iron. The length of this angle is approximately 8 feet long, 4 feet of which is securely anchored in the ground. Before the angle was erected we layed off the various bolt circles on the

sides of the angle, and to save drilling so many holes, we drilled one hole and made a slot for the opposite hole.

When it becomes necessary to make up a flange on a piece of pipe or even take one off, the flange is bolted to the angle iron post and the weight of pipe is carried on a support. Then the pipe is turned with either a pipe wrench or chain tongs.

For example, if we want to make up a piece of 4" pipe with a 9" O.D. flange, here is the procedure. A 4" flange has a  $7\frac{1}{2}$ "

bolt circle, diameter of bolts is 5/8". If the pipe is long we use the hole and slot for 7/8" bolts by putting washers under the head and nut of the 34" bolts. The flange is first screwed on the pipe by hand. Then the flange, with pipe attached, is brought up to the face of the angle. The weight of pipe is carried on horses or blocks. We use two opposite holes in flange. A washer is put under the head of the 3/8" bolt and bolt is passed through the top hole in flange and through the hole in face of angle, the opposite hole in flange is fastened through the slot and both bolts are made tight. Then the pipe is turned up tight with a wrench. - GEORGE AVANT. WILMINGTON, N. C.



# Feedwater Regulator Maintenance

# By R. F. PAINTER

Mechanical Engineer
Northern Equipment Division
Continental Foundry & Machine Company

Here is a check-chart program of inspection and preventive maintenance for feedwater regulators. Reward for such a program will be increased accuracy and dependability, regardless of type of equipment in operation.

It is hardly necessary to review the importance of accurate and reliable control of water level in a power boiler. Aside from actual damage to its boiler or prime mover, the intangible difficulties which a troublesome feedwater regulator can introduce into a generating system are myriad.

For these obvious reasons, most manufacturuers of feedwater control equipment have placed dependability at the top of the list of the factors which determine the size, shape and general design of their equipment. Perhaps accuracy and simplicity would follow in that order. These are factors which are given much consideration by the designers and manufacturers. Naturally, a successful application of all these factors must be combined in any piece of equipment before it can have the slightest possibility for extended periods of good service.

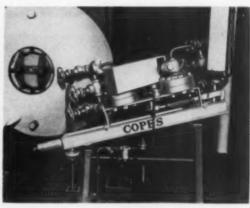
In spite of all these considerations, the most ingenious devices and their clever application, the most important factor in dependability is undoubtedly a regular program of inspection and preventive maintenance.

It is not always possible to determine the condition of feedwater control equipment by merely keeping a close watch on its performance as shown by chart recordings of drum level and water flow. Chart recordings provide an accurate picture of the present and past performance of the regulator, without giving any hint toward the immediate future. The more complicated and intricate the control system, the more important this fact becomes. Since future performance and dependability are of the utmost concern to the plant efficiency engineer or maintenance man, past records and experience can serve best as a guide in setting up a regular maintenance schedule. Based on this premise, the following comments are made for maintaining feedwater regulators.

Feedwater regulators can be considered under two major classifications: Direct Operated and



These views show two Copes control installations in Southern plants. The one on the left serves an industrial power plant and the one at the right is in a large utility company steam-electric station.



SOUTHERN POWER & INDUSTRY for JUNE, 1951

# TABLE I-MAINTENANCE OF DIRECT OPERATED FEEDWATER REGULATORS

(Where boiler forces alone are used to measure flow and level and are used directly to position a control valve)

PART	WHAT TO INSPECT	INSPECT FOR	CORRECTIVE PROCEDURE
LEVEL ELEMENT			
	a. connecting piping	<ul> <li>leaks around pipe joints and valve packings</li> </ul>	<ul> <li>a. tighten joints, unions or flang- bolts; tighten valve glands or re- place packing.</li> </ul>
	b. mechanical linkage	b. excessive collec- tion of dirt or paint; binding or bent linkage	<li>b. clean with air or vacuum; remove paint; lubricate pin joints with light oil; align bent linkage.</li>
	c. blowdown valve	c. leaks — hot drain line	<ul> <li>c. replace valve or install double shut- off.</li> </ul>
STEAM FLOW			
ELEMENT	a. connecting piping	a. leaks a'round manifold piping and valves	<ul> <li>a. tighten valve glands or replace packing.</li> </ul>
	b. stuffing box	b. leaks	b. tighten gland or replace packing.
	c. connecting piping	c. clogged impulse lines	<li>break unions or flanges at manifold and blow down for 20 sec.</li>
	d. rotating shaft	d. excessive friction	<li>d. loosen packing and lubricate with a mixture of powdered graphite and penetrating oil.</li>
	e. stuffing box bearing	e. accumulated dirt or corrosion	<ul> <li>e. wash bearing in cleaning solvent and pack with wheel bearing grease.</li> </ul>
	f. diaphragm	f. deterioration	f. replace if necessary.
	g. internal linkage	g. alignment and wear	g. replace if necessary.
REGULATING VALVE			
	a. valve stem	a. accumulation of dirt—corrosion	a. polish stem with crocus cloth.
	b. packing	b. excessive friction, leaks	<li>b. replace annually with packing of manufacturer's specifications; lubri- cate monthly with grease or a mix- ture of powdered graphite and penetrating oil.</li>
	c. internal linkage	c. wear	c. replace worn parts.
	d, valve body	d. corrosion or ero- sion of bell sec- tion	<li>d. cavities may be repaired by weld- ing; replacement bodies should specify WC-6 steel.</li>
	e. diaphragm or bellows	e. deterioration, fa- tigue cracks or tiny leaks	e. replace if necessary.
	f. internal fittings of ported plunger	f. wear or erosion; scale formation	f. replace if necessary; if replacements are required more often than every 5 years, stellite facing of all contact surfaces should be specified.
150			Note: under severe conditions of scale formation, valve should be operated through entire
		-	stroke by hand, several times

# Relay Operated.

Because of wide-spread differences between the two types, their maintenance should be considered separately.

Direct Operated regulators are

usually specified for the low steam pressures, where simplicity and first cost are important considerations.

However, where the most accurate control is required and the in-

creased flexibility of remote manual control is desired, it is necessary to use a relay operated regulator. Size and pressure are unlimited for this type of control.

Most manufacturers offer one,

two and three element control systems for various types of boilers and load conditions. Regardless of the number of control elements, the basic components that make up these systems are alike, and vary only in their number and application. Table 2 offers a program of regular inspection and maintenance for the pilot valves, combining relays, positioners and power cylinders.

# TABLE 2-MAINTENANCE OF AIR OPERATED FEEDWATER REGULATORS

(Where primary measuring elements, position a control pilot and through combining relay or amplifier, act to position valve or power cylinder)

PART	WHAT TO INSPECT	INSPECT FOR	CORRECTIVE PROCEDURE
PILOT VALVES			
	a. bushings b. plungers	a. wear b. wear, corrosion, excessive friction. Plunger should fall through its stroke of its own weight	a. replace if necessary b. replace; polish lightly with crocus cloth; remove all oil and coat with powdered graphite or Molykote.
	c. ports and orifices	c. dirt and chips	c. clean with carbon tetrachloride and compressed air.
	d. packing	d. excessive friction or leaks. Glands must not be tight.	<li>d. lubricate with light oil or replace if necessary.</li>
	e. control range adjustment	e. loose lock nuts or changed set point	<ul> <li>e. consult manufacturer's instruction manual.</li> </ul>
LINKAGE	a. pins, ball joints, levers	a. binding, corrosion, wear, dirt	<ul> <li>a. polish with crocus cloth and lubri- cate with light oil.</li> </ul>
COMBINING RELAYS			
	a. diaphragms and bellows	a. deterioration; fa- tigue cracks, dis- tortion	a. replace if necessary.
	b. springs	b. changed set point	<ul> <li>replace springs—consult manufac- turer's instruction manual.</li> </ul>
	c. ball valves	c. dirt	<li>c. blow out with air, clean seats with solvent.</li>
	d. needle valves	d. collection of gum; changes in throt- tling characteris- tics	d. polish needle with crocus cloth.
	e. packing	e. excessive friction or leaks	e. replace if necessary.
	f. constant pressure air re- ducing valves	f. variable con- trolled pressure	f. clean and replace seats.
POSITIONERS			
	a. flapper valves	a. dirt	<ul> <li>a. clean with solvent—lubricate flap- per with light oil.</li> </ul>
	b. linkage	<ul> <li>b. binding or mis- alignment and ri- gidity</li> </ul>	<ul> <li>disconnect and straighten linkage;</li> <li>tighten connections.</li> </ul>
	c. bellows	c. fatigue cracks or leaks	c. replace if necessary.
TRANSFER PANELS			
	a. auto-manual gauges	a. errors in pressure indication	a. calibrate with dead weights.
	b. transfer valve	b. leaks	b. tighten seats and plug.
	c. reducing valve	c. erratic action— lost motion	<ul> <li>c. clean seats—replace diaphragm if necessary.</li> </ul>
POWER CYLINDERS			
- Com Common	a. pistons	a. dirt and chips, binding, excessive friction, leakage	a. see manufacturer's instruction manual.

As power demands increase and industries expand their water needs, the proper selection, operation and maintenance of industrial cooling equipment is of paramount importance to Southern, and particularly Southwestern industrial plant engineers.

This up-to-date report has been adapted from a Symposium on Cooling Towers presented at the American Society of Mechanical Engineers Spring Meeting in Atlanta, Georgia, April 2-5,

1951.

Two of the excellent papers have been extensively reported and others briefly summarized. Reprints of complete articles may be ordered from the A.S.M.E. Note the tabulation at the end of this discussion.

A.S.M.E., Atlanta, Georgia, April 2, 1951

# Symposium on COOLING TOWERS

**Featuring** 

"Gulf Coast Operating Data" and "Premature Wood Deterioration"

# Operating Experiences in the Central Gulf Area

By HARRY G. HIEBELER

Houston Lighting & Power Company Houston, Texas

ELECTRIC power requirements of Houston, Texas and the surrounding area are supplied from 4 major generating stations of the Houston Lighting & Power Company totaling about 625,000 kw in net capacity.

Of this 440,000 kw or 70 per cent operates on circulating water systems employing mechanical draft towers for cooling. Of the other 185,000 kw, 160,000 is at Deepwater, a 1450-350 psi station on the ship channel, and the remaining 25,000 kw in the older 200 psi

section of the uptown Gable Street plant. Gable Street also has 65,000 kw (gross) in two modern 850 psi 900 F units on towers. Our largest units on towers are the two 85,000 kw machines at the West Junction station, which with a total of 250,000 kw (gross) on towers should rate it well toward the top of the list of large central stations wholly on such systems.

It will, however, within the next two years, be dwarfed when two machines of 110,000 kw gross each are added to the 140,000 kw already in service on towers at the Greens Bayou station. This will total 360,000 kw (gross) at this site and 650,000 kw net on towers for the system.

Experience at Houston with towers goes back about 12 years to the installation of a small forced draft tower to serve a 25,000 kw machine at Gable Street. This was followed by a 40,000 kw unit in 1943 at West Junction also on a forced draft tower and by a duplicate machine there on an induced draft tower in 1947. Two units of 70,000 kw capacity each on induced draft towers went into service in 1949 at Greens Bayou. Another machine, 35,000 kw on an induced draft tower was completed last spring at Gable Street. An 85,000 kw unit with induced draft tower came on last August at West Junction with a duplicate machine added this February. The experiences which will be related refer to these installations.

The operator of a plant or of equipment of any kind is interested primarily in the reliability of that plant or equipment. He is, of course, also concerned with performance but that, if not too radically off, is usually secondary

# No Manufacturer's Criticism Intended

In presenting his excellent paper at the A.S.M.E. Spring Meeting in Atlanta, Harry G. Hiebeler of the Houston Lighting & Power Company emphasized that no criticism of any manufacturer or his product is intended. While the predicted performances were not always met in-

itially, in every case the manufacturers, including his suppliers, gave the fullest cooperation to correction of troubles, furnishing additional cells if required, testing, changing at their own expense here and there to effect every improvement possible in the equipment.

to the ability to keep going. So it is with cooling towers.

# **Operational Data**

Reliability of mechanical draft tower essentially that of the fans and fan drives . . . good service record for motors . . . inspection schedules . . . totally enclosed motors recommended.

The 16 forced draft fans on the original Gable Street towers are driven by 20 hp direct connected 440 v motors at 385 rpm. These have been in service 12 years. While not the conventional totally enclosed type, these motors are enclosed in finned casings cooled by the air stream. Two weep holes at bottom allow breathing with temperature changes and prevent accumulation of any condensation. Sixteen similar direct connected motors, but of 25 hp size, drive the slightly larger fans on the first tower at West Junction and have seen 71/2 years of service.

There have been two motor failures at Gable Street and four at West Junction. These at each plant were divided equally between actual coil failures and

those due to ball bearing failures which allowed rotor to drop down and rub the stator. These six failures in approximately 312 fan years of operation or one in 52 fan years seem very satisfactory to the operators.

Actually some of the bearing failures might have been headed off by more frequent inspection. Because of manpower shortage and tight schedules during the war, the period between inspections of some of these fan motors went to as long as three years. A two-year schedule with half of the units coming out every year seems preferable.

Incidentally these ball bearings are not of the sealed type. It is possible to apply too much grease which then gets into the motor proper. With the pressure relief design similar to that used by General Electric or the lifetime pregreased ball bearing of Westinghouse it is believed that a 5-year inspection schedule would be satisfactory.

For the second unit at West Junction an induced draft tower was chosen. The motors are 25 hp conventional splash-proof 1800 rpm design. On the 18 units in 3¾ years' service there has been one failure, a coil breakdown in the slot. This is one in 67½ years' service, if this proves anything. Our electrical operating men did not recommend the application of splash-proof motors here due to the general high humidity and moisture conditions. They still have not altered their opinions despite this apparently satisfactory record. These motors are on a two-year inspection schedule.

On the newer towers at Greens Bayou, Gable Street and West Junction, General Electric or Westinghouse 30-hp totally enclosed fan cooled motors were used. All told there are 122 of these with from two months to two years of service. No failures have occurred but a few bearing replacements have been made. It is hoped that a five-year schedule will work out satisfactorily here.

On experience to date, our recommendation for tower fan drives would be totally enclosed motors. In these small sizes the initial cost runs but 10 to 12 per cent over the splash-proof type and it appears that this extra cost will be more than offset by reduction in inspection and maintenance charges.

#### Fans

Good record for fans on forced draft towers . . . not too good on induced draft units . . . fan blade failures discussed.

The fans proper on the forced draft towers also have a good record. Fifteen of the 16 fans on the original Gable Street unit are 8bladed 11-ft diam Dowmetal units. The other is of plastic impregnated fabric composition which was installed to test the material. Sixteen fans, 4 bladed, of 14-ft diam on the first West Junction tower are of textolite impregnated wood. There have been no failures at Gable Street. Two failures which occurred shortly after starting at West Junction were due to manufacturing defects. Another, which occurred during freezing weather this winter, was apparently due to fan striking ice accumulation but this also showed latent defect. Some "weathering"

# Better Design and Application Forthcoming

The use of large multiple cell mechanical draft towers for central station circulating water cooling is a development largely of the past decade during which time many of the designs were changing, evolving and crystalizing.

Much of the fundamental data on tower performance was from single cell experimental tests and in some cases, to say the least, the tests were not exhaustive.

The effects of various groupings into multiple cell arrangements were

not known or properly anticipated. Correct spacing and location with respect to other towers and neighboring buildings or terrain had to wait on experience. War and other conditions during part of the period were hardly conducive to study or research. With an increased number and capacity of towers in service in industrial as well as central station service it should be possible to accumulate a background of information and data which will make for better design and application in the future.

or slight roughening of surface has developed and sheet copper protection was applied to the leading edges of blades to halt erosion.

#### Six Blade Fans

On the induced draft towers the fan record has not been too good. On West Junction No. 2 in slightly over 3½ years 15 blade failures have occurred. All but one of these occurred during the first year of operation and were mainly due to manufacturing defects.

One occurred this past February on one of the original fans which had previously had no failures. These fans have 6 blades and are of the resilient blade mounting, unitized pitch adjustment type. Blades are of all welded construction of corrosion resistent materials of airfoil cross section. Blades contain longitudinal spars welded to strut sections around which is stretched the skin, composed of relatively heavy sheet monel or stainless steel.

The inner end of the blade terminates in a spoke which is merely a transition piece changing the shape from the airfoil section to the cylindrical cuff. The cuff contains a resilient mounting in which the blade tube is mounted. The blade tube is bolted rigidly to the fabricated hub assembly. Pitch adjustment is cleverly accomplished by slight axial shifting (between screw stops) of a disc on the hub. This has holes which engage projecting yokes attached to the blade cuffs thus allowing simultaneous pitch adjustment on all blades. A segmented air seal in the shape of a conical pan is bolted to the structural hub to form the aerodynamic hub preventing recirculation through the ineffective center of the fan assembly. This fan has somewhat higher efficiency than other types subsequently tried but service record has not been too satisfactory.

#### **Five Blade Fans**

On the two towers at Greens Bayou, 5-blade tube or spoke failures have developed on the 28 fans on No. 2 tower in 2½ years' operation and none on No. 1 tower in almost three years. There have been two similar failures on the

16 similar fans at Gable Street in a year's running. The West Junction No. 3 tower with the same fans has been operating since last August without a failure. Another 30-fan unit there went into service early in February this year and at this writing has had no fan trouble.

# Four Blade Fans

The fans on these most recent towers are of fabricated airfoil 4-blade construction. Each blade consists of an upper and lower sheet of stainless steel formed on presses and welded together. The upper sheet is riveted to the spoke or center support member made up of 2-in. tubing extended by a flat bar. The round section extends only about 14 in. into the airfoil section.

The blades are attached to the cast iron hub by flanges with slotted bolt holes to permit pitch adjustment of individual blades. A center seal pan of relatively thin metal is bolted to the center hub and attached to the blade shafts by U-bolts. This effectively seals the hub of the fan but has proved structurally inadequate. Cracking of the seal pan at attachment points due to flexing of the blades has not yet been overcome.

The blade tube failures at Greens Bayou and West Junction had some appearance of vibration fatigue and as there are 122 units all told, further experience is anxiously awaited.

#### Reduction Gears

Most serious difficulty . . . more conservatism in design and application necessary.

However, the most serious difficulties of operation have been with the worm type reduction gears. Gear troubles on the first West Junction induced tower have

# Performance Data Summarized

Towers generally fell short on original tests of guarantees which call for a 14 F approach to a 76 F wet bulb with rated flow and heat loading. On some, the deficiency was of sufficient magnitude to require that additional cells be added. On others the investment required by the company for added basin, circulating piping, electrical connections, etc., to accommodate manufacturers cells was not justifiable and none or only partial correction was made and other adjustments worked out. These towers generally are low head units with about 20 ft water fall.

West Junction No. 3 tower, on which substantial modification in design including increase in effective height of 5 ft was made following the Greens Bayou tests when tested alone last summer did meet predicted performances. However, these predictions were for operation with No. 4 unit in service. Such tests have not yet been run.

For future units the towers will be higher. The new towers for Greens Bayou 80/100 megawatt units will be of 35 ft effective height, 10 ft higher than the latest West Junction units and 15 ft above the present Greens Bayou designs.

Extensive tests and observations were made on the Greens Bayou units continuing over a several month period. These towers, as is the practice at Houston, were lined up in the direction of the prevailing breezes, which are southeast in summer. With the wind in this direction recirculation is at a minimum and a free flow of fresh air reaches each side of the tower. However, the leeward tower will still show 1.0 F to 2.0 F poorer performance or approach to the wet bulb than the windward unit, indicating some recirculation although it may not be apparent by observation.

Individual performance also varied by as much as 2 F from day to day probably with the wind velocity and direction, recirculation and also with atmospheric conditions such as temperature, humidity, etc. The exact factors or their relative effects are not known but vapor drifts straight up on occasions with little or no recirculation and at other times whips downward in a regular ground fog.

The same phenomena were observed with the vapor from 60 ft high exhaust stacks from Maxim silencers on the atmospheric exhaust of a large turbine operated for peaking capacity a few years ago. As the velocity in this exhaust at times approached 200 ft per second, we would conclude that velocity of exhaust is not the controlling factor.

If the induced draft tower has any margin over the forced draft in discouraging recirculation it is very small.



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# Symposium on Cooling Towers (Continued)

been relatively minor. On Greens Bayou Nos. 1 and 2 towers complete replacement of the 48 original gears was necessary after a year's service. Replacement of 16 gears at Gable Street was also made by the manufacturer.

The severe wear was variously attributed to improper lubricating oil, wrong oil level, and poor quality of bronze in the gears. The manufacturer's lubrication recommendations had been followed throughout including two changes in type of lubricant. After replacement the lubricating oil was changed to an extreme pressure type with lead naphthenate added. The actual oil is Humble Co.'s Pen-O-Led No. 3 containing 71/2 per cent lead naphenate concentrates of which 20 per cent is metallic lead. Resort to this lubricant seems to indicate that high tooth pressure design has been used.

It is planned to make examination of some of these replacement gears units this spring when they shall have accumulated several months' operation. At this writing preliminary examination through filling plugs of a few gears shows some, but less serious wear than on the original units, is occurring.

As to whether or not another type of gear would prove more satisfactory we cannot say. As a result of our experience and that of others which have been reported, more conservatism of design or application of any gear unit seems necessary. While a fan seems to offer a uniform nonshock load, it is difficult to get and maintain good dynamic balance particularly in the larger sizes and most manufacturers have yet to recognize the desirability of perfect balance. Efforts are made to provide solid substantial foundations at top of a tower but they can not compare with what may be achieved at ground level or other places where gear applications usually are made. Some effects of change of pressure on blades as they pass over cross members in the supporting structure are noticeable.

### Oil Leaks

Leakage at upper seals at output shaft and seals at the input shaft . . . eliminate all connections possible.

Less serious but quite aggravating have been the numerous oil leaks from the units. As this oil drops directly into the circulating system such leakage cannot be tolerated. The main and larger leaks are at the upper seals at output shaft and the seals at the input shaft. Originally the latter were of the packed type which were entirely unsatisfactory.

Some improvement has been made by substitution of a metallic seal here but further improvement is desirable. Leaks also developed from the oil level standpipe connections and vent lines and from the external piping from the oil pump and from the bottom plate which gives access for vertical adjustment of the worm wheel. On the replacement units the oil pump piping was made internal. Oil is notably hard to hold and the best solution is to eliminate all connections possible. These included sight oil gates which proved difficult to see anyhow, and

oil pressure gages which were inaccurate and rusted badly. Except for leakage which should be detected by the operator on his periodic rounds the oil system should be such as to require attention only at three to six months interval. On present units after several months' operation the oil shows no deterioration and it is hoped that oil changes can be set up on an annual basis.

#### **Wood Deterioration**

Mention should also be made among the operating problems of wood deterioration. To date our troubles have not been too serious. but it appears that they may increase with age of the towers. Briefly, the first Gable Street tower replacement of mist eliminators and supports due to delignification was required after about 6 years operation. Last year evidence of brown rot and other fungi attack were found in the wet-dry zone above the trays. Replacement of inside sheathing was made in this area this year. Mist eliminators were also replaced but this was due to use of improper material for this service.

On examination last year of the West Junction No. 1 tower after 7 years service some spots of delignification were found on the air

# Why is Deterioration Increasing?

The mechanical forced-draft tower began to replace the atmospheric deck-type tower approximately 20 years ago, while the induced-draft tower has come into wide use during the past 10 years.

A larger volume of water per unit time may be passed over a mechanical-draft tower; this would accelerate the leaching of extractives, the erosion of the wood, and the chemical effect of any compounds present in low concentrations.

The lower drift loss in mechanical-draft towers leads to a lower requirement of make-up water. This in turn leads to a more rapid concentration of dissolved solids in the water. A further effect, of obvious significance, is that with the lower drift loss, it has become feasible to treat the make-up water.

In many areas, the use of enormous quantities of well water by expanding

industry has led to a serious drop in ground-water levels, with the result that surface water is increasingly used. As compared with ground waters, surface waters tend to contain more suspended matter, which might increase their erosive action. They also contain more dissolved organic matter, which could conceivably stimulate the growth of wood-destroying fungi as well as fouling organisms.

Surface waters are much more likely than ground waters to carry spores and fragments of mycelia of wood-destroying fungi, as well as small fragments of rotting wood. Surface waters are generally lower in content of dissolved minerals and in some areas the carbonate content is so low that caustic soda is added to compensate for the lowering of pH that accompanies the addition of chlorine.



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baffle below the fill. This baffle is installed to direct air into the center of the tower. These spots were all at points where evaporation of leakage through the baffle had built up a concentration of salts. On No. 2 tower after 3 years operation several boards were replaced because of white fungi attack in the section above the distribution troughs and below the

Possibly the biggest problem facing the tower operator will be to combat deterioration of the wood. Substitution of other materials such as transite should be investigated.

# Deterioration of Wood in Cooling Towers

By R. H. BAECHLER and C. AUDREY RICHARDS

U. S. Department of Agriculture Forest Products Laboratory

THE following conditions apply only in a general way to any given tower. Variations are found in the design of the tower, quality of wood, operating practices, treatment applied to the water and the raw water itself.

Moisture conditions vary. Some parts are submerged in water while others are dry most of the time. Some parts are subjected to constant flow of water while the tower is in operation. Wood in such locations will reach and remain at a high moisture content, so that decay presents less of a hazard than chemical attack. Nevertheless, the water is highly aerated and even these parts may decay. Other parts of a tower are bathed in a mist and because of the favorable temperatures maintained, vulnerable wood may decay. Still other locations involve intermittent splashing or flooding, with opportunity for subsequent evaporation and concentration of any chemicals in the water.

# **Water Usually Treated**

The water in most plants is treated with various chemicals to prevent the formation of excessive scale, especially a hard scale, in condensers, heat exchangers, boilers, etc.; minimize the corrosion of metals with which the water comes in contact; and to prevent the fouling of equipment by algae.

A pH of 8 or above is usually maintained in order to reduce corrosion; a pH of 7 or slightly below

would be more favorable for wood. but protection of metallic equipment takes precedence over protection of the wood.

In some plants using a zeolite type of water softener, the pH may reach values above 11. In other plants, either sulfuric or sulfurous acid is used to convert carbonate to sulfates, which are more soluble and less prone to form scale. Imperfect control sometimes drops the pH to as low

Chlorine has been the almost universal algaecide used. Most plants attempt to keep the concentration in the neighborhood of 1 part per million but failure of the controls may result in much higher concentrations for short periods.

In oil refineries and chemical plants, leaks in the equipment sometimes permit reactive materials, such as acids, ammonia, hydrogen sulfide, sulfur dioxide. and mercaptans, to escape into the water. The duration of the periods during which contaminated water has been passed through a tower is not always known with certainty. and the importance of such fluctuations is hence difficult to estimate.

In addition to an expanded dis-

(Continued on Page 118)

# Types of Wood Deterioration

The premature failures of redwood in cooling towers have been attributed to one of two causes:

1. Living organisms called fungi. which are responsible for decay

2. Chemicals present in the water When wood decays it undergoes a profound chemical change. The term "chemical attack" is used only to describe any deterioration caused by chemicals in the water and not influenced by the growth of fungi. The possibility that decay and chemical attack might proceed simultaneously and more or less independently has been recognized. Furthermore, it is known that chemical attack and decay are sometimes interdependent; under certain conditions, a chemical may react with toxic extractives to form nontoxic compounds and thus render the wood vulnerable to decay.

A third type of deteriorationphysical erosion of the wood by the water-no doubt plays a role in the gradual reduction in cross section that occurs in members exposed to a continuous flow of water. Suspended matter in the water would be expected

also to intensify this eroding effect.

In the most common type of chemical disintegration, the surface fibers become delignified so that the surface becomes a mat of white fibers, These fibers are either loosely attached or tightly compressed on the surface giving the wood a "painted" appearance.

Type of decay found most frequently is a light pocket rot that commonly occurs in eliminator slats. Surface of the piece appears sound and is frequently covered with algae and fungi, but the interior is pitted, soft, and in extreme cases fibrous.

Brown cubical rot is uncommon in the slats but has been found in the timbers. In contact with iron fastenings, this type gives the wood a charred appearance.

True decay of wood in cooling towers has been definitely established in numerous instances. The question that remains is not whether redwood ever decays in a cooling tower but why it decays in one tower and not in some other in which conditions appear to be quite similar.



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### By STEPHEN REED

Field Engineer
Plymouth Cordage Company

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### **Buy Good Rope**

This does not necessarily mean the highest priced rope, for sometimes color and appearance are given consideration beyond their value from a strict utility point of view, but rope from first grade manufacturers which is carefully constructed and held to a standard for its grade, should receive first consideration.

### Don't Overload

This is both costly and dangerous. It will be found that rope conservatively loaded—we recommend a factor of safety of 5 under most conditions—will give longer and safer service than rope which is continually overloaded and there will always be some reserve strength in emergencies.

Avoid unnecessary surface wear and abrasion, especially in the smaller ropes where the amount of surface abrasion directly af-

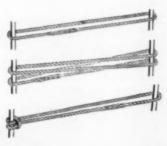
fects the tensile strength. Anything that can be done to reduce surface abrasion is a direct contribution to conservation. Do not permit the ropes under tension to rub against stationary surfaces unless it is absolutely unavoidable. Do not drag them through sand or other gritty material as these sharp particles work into the rope and gradually abrade the inner fibers. Never use a rope which rubs the cheeks of a block in tackle work. This not only abrades the surface but has a tendency to throw the rope out of lay. If a rope must render around stationary objects such as cleats or winch heads, be sure they are as smooth as possible so that

Break Tests of Slings with a Straight-Line Pull Strength of single rope 4,840 lb. Pins 2-in. diam.

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B—Four-Part Sling (two part doubled)
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All breaks on pin. Strength of sling
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C — Two-Part Sling (Looped) — Theoretical strength of two parts 9,680 lb. Average break at 6,530 lb. All breaks in hight. Strength of sling 134% of single part of rope.



Increasing the number of parts of the sling does not increase the overall strength of the sling proportionately. The factors given should be used only as a guide to the relationship between the straight tensile strength of the various methods of applying the slings, as practically every application will vary in one or more of the following conditions: sling angles to the load, radius of the curves, type of sling used, and method of application. Safety factor of at least 5 is recommended for all types of slings. For new rope, this may be slightly on the high side but as the slings become worn, a high factor of safety is essential.

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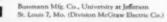
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\_\_\_\_\_\_\_Srate \_\_\_\_\_\_551

there will be no cutting of the surface fibers.

When a rope bends around a sharp corner, the inner fibers are under no tension and the outer fibers are excessively loaded. This has a tendency to overload the outer fibers. It has been found that it requires a capstan of approximately 20 times the diameter of the rope before a rope will develop its full strength. Also if loaded around sharp corners, the natural elasticity of rope permits some movement of the rope against the corner, resulting in rupture of the fibers directly against the sharp surface.

Never permit a rope under tension to swing against a stationary object. Many ropes are cut because they are jammed between two unyielding surfaces when the rope is under heavy tension. Avoid permitting the rope to drag against sharp projections under load. Projecting nails from timbers often cause unexplained breaks in cordage. When ropes break under reasonable loads, the cause is sure to be some previous undetected damage.

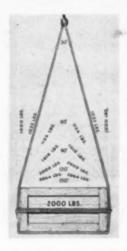
### Watch the Twist

Wherever possible, maintain the twists in the rope in the same relation as when the rope came from the factory. This is an important point and one which is often neglected, causing much premature rope destruction. Rope is constructed with a series of reverse twists. The yarns are twisted to the right. The proper number of these yarns are then combined in a strand which is twisted to the left. Three of these strands, sometimes four, are then combined and twisted to the right. As the rope is twisted to the right. the strands are also twisted to the left so that the original strand turn is maintained. It is these reverse twists which hold the rope together, and it is important to the life and strength of the rope that they be maintained as nearly as possible in their original relation. When the rope is untwisted, additional twist is added to the strands and when the rope is tightly twisted, the strands are softened. Twisting the rope in either direction disturbs the relation of the twists and has a tendency to weaken the rope as the greatest strength is obtained when the yarns and fibers in the rope are in the same relative position as when the rope was manufactured. There are many uses, capstan work in particular, where turn is continually lost or gained between the capstan and the surplus fall. If the strands of a rope become distorted, or the rope becomes kinky, steps should immediately be taken to balance the turns.

### Equalize Wear

Wherever possible, equalize the wear throughout the length of the rope. If a short section only of a rope is used, frequent reversals add much to the length of life. If the use is such that wear occurs at regular intervals, a slight change in the length of the rope will change these sections subject to wear and again increase the life of the rope. Rope tackles are typical of this type of service. It is often economical to cut out a badly worn section and put in a good splice. A well made splice is much safer than a damaged section.

When ropes must be used outdoors under tension, care should be taken to relieve the tension when the rope is subject to wetting, providing it is held between two points which cannot yield. When vegetable fiber is wet, it swells thus increasing the diam-



Note the increase in tension on the sling due to the angle of the sling above the load. Obviously, the straight line is the most efficient but usually is unobtainable. Large angles above the load should be avoided wherever possible and due consideration for the extra tensile strength required should be given when it is necessary to use these very close attachments.

The table below gives the safe load for a 2 part sling when used with various cangles under the hook. The figures are based on a factor of safety of 5 and on the assumption that the 2 part sling has 165% elliciency. The lifting component is computed at 85% of the straight pull at a 60 degree angle, 70% at a 90 degree angle, and 50% at a 120 degree angle under the hook.

### SAFE LOADS FOR SLINGS IN POUNDS

	Safe Load	Double (Two-Leg) Sling Degree of Angle Under the Hook					
Dia.	for Straight Pull	60 degrees	90 degrees	120 degrees			
9 16 13 16 13 16 13 16 15 16 16 16 16 16 16 16 16 16 16 16 16 16	530 690 880 980 1,080 1,300 1,540 1,800 2,100 2,400 2,700 3,700 4,500 5,300 6,200	743 968 1234 1374 1515 1823 2160 2525 2945 3366 3787 4208 5189 6311 7433 8696	612 797 1016 1132 1247 1502 2779 2426 2772 3119 3465 4274 5198 6122 7161	437 569 726 809 891 1073 1271 1485 1733 1980 2228 2475 3053 3713 4373 5115			

# The TERRY TURBINE



Air Conditioning

AT

MADISON SQUARE GARDEN

In 1925 Madison Square Garden installed three Terry Multi-Stage Turbines to drive air conditioning and refrigeration compressors. These units deliver 290 hp at 3500 rpm with steam conditions of 100 psi exhausting to a 26 in. vacuum.

After 22 years experience Madison Square Garden installed three more Terry Multi-Stage Turbines, one of which is shown above. This unit delivers 330 hp, at 5650 rpm, with steam at 100 psi exhausting to a 25 in. vacuum.

The same engineering talent and manufacturing facilities that produced these turbines are available to assist you in obtaining efficient power generation.

Any of our District Representatives will be pleased to give you full information on a turbine drive for your requirements. No obligation. May we send you descriptive bulletin?



THE TERRY STEAM
TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.



eter of the rope and shortening the length of the lay. This has a tendency of drawing the rope together causing it to shorten and, depending upon the degree of

wetting, it can shorten as much as 10%. If the rope cannot yield, it will stretch and as soon as it dries, it will be appreciably longer than its original length. A continuation of this stretching will ultimately rupture the rope.

### Keep It Clean

Keep the rope clean. If it be-

FOR REGULAR MORTISE INSIDE IRON STRAPPED BLOCKS

Duesnessons Inches		SUITABLE WORKING LOADS							
		With	Loose Side	Hooks	With Shackles				
Length Shell Inches	For Diameter Rope	Double and Single Pounds	Two Doubles Founds	Two Triples Pounds	Double and Single Pounds	Two Doubles Pounds	Two Triples Pounds		
3	3.	200	300	400	400	800	1,200		
4	1.2	400	550	700	800	3,400	1,800		
5	34	500	750	1,000	1,100	1,700	2,100		
6	32	1,000	1,500	2,000	1,600	2,400	3,000		
7	34	1,500	2,000	2,500	2,000	3,000	3,700		
8	1	1,700	2,450	3,200	2,400	3,600	4,400		
10	156	2,600	3,400	4,200	4,000	5,400	6,400		
12	134	3,000	3,750	4,500	5,000	8,000	10,000		
	FC	OR HEAV	WIDE.	MORTISE	BLOCKS				
6	36	1,500	2,000	2,500	1,600	3.000	4,000		
7 8	1	1,700	2,450	3,200	2,000	3,800	4,800		
8	114	2,200	2,900	3,600	2,400	4,700	6,700		
10	112	3.000	3,750	4,500	4,000	7,000	9,000		
12	115	3,600	4,800	6,000	5,000	9,000	12,000		
14	134	4,400	5,700	7,000	6,500	11,000	15,000		
16	2	6,000	7,500	9,000	8,000	14,000	18,000		

NOTE: These tables are shown through the courtesy of the Boston & Lockport Bit Company and indicate suitable loads for one series of their standard. Company and indicate suitable loads for one series of their standard. These should be used as a guide only in ordering without assuitable — since the loads will vary between blocks in the manufacturer's blocks in other manufacturer's lines. Remember, too, that these are loads for BLOCKS, not rope. Safe working loads for rope are high

### Suitable Working Loads for Blocks

(for Manila Rope)

### Calculating Mechanical Advantage of Tackle

The mechanical advantage of tackle is determined by the number of multiplications of the fall. Theoretically, the advantage is indicated by the number of parts to the moving block, but a 10% friction factor should be added to the load for each sheave in the assembly. A simple example is as follows:

Load to be lifted-5,000 lb

Tackle consists of two double blocks-4 sheaves, 4 rope parts at the movable block.

Mechanical advantage-4

Friction loss, 4 sheaves: = 40%

5000 lb + 40% = 7,000 lb

7,000 lb ÷ 4 (mechanical advantage) = 1750 lb

Pull needed on fall-1,750 lb

Assuming the rope is comparatively new, a safety factor of 5 is desirable, so,

1,750 x 5 = 8,750 lb, the required rope strength Referring to the rope-size strength table, a 1-in.

diameter rope, with a minimum break of 9,000 lb, is a safe rope size to use.

Reference to the table on the safe working load for blocks indicates that the 8" block regularly used for 1" diameter Manila rope is not suitable for a 5,000 lb load. A 10" shackle block is required, a size regularly built for 1%" diameter Manila rope.

There is another method of figuring the mechanical advantage of multi-sheave tackle which is thecretically more accurate. For the above example it would be as follows:

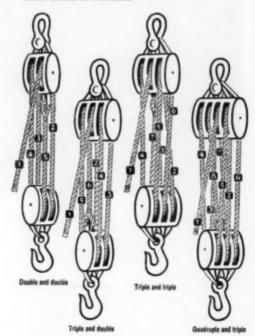
5.000

 $\overline{4 \times .90 \times .90 \times .90 \times .90} = 1900$  lb pull used on fall

The first method is somewhat more simple and sufficiently accurate for practical purposes. The 10% friction per sheave is an arbitrary figure. Roller bearing sheaves in good condition probably do not add 10% friction load, while plain bearing sheaves in only fair condition may add considerably more. As in all rigging work, good judgment must be used as to the condition of all equipment.

The safe working load for the blocks should always be checked when tackle is figured. The safe working load for rope is usually greater than the safe load for normal sized blocks.

The choice of the proper factor of safety in tackle depends to a large extent on the experience of the user. With ideal conditions, that is, new high quality rope, proper size blocks, and no shock loading, a factor of safety of five should be used. With old rope, or with unfavorable rope conditions, this factor should be increased.



### Proper Method of Reeving Tackle

Note that in each case the tackle is reeved so that the movable block is at right angles to the fixed block.

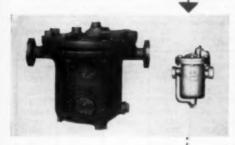
In the case of a single and double or two double blocks, this method of reeving is not as essential as it is when the number of parts are increased.

The method of reeving two double blocks so that the center lines of the movable and stationary blocks are parallel is not illustrated but it is perfectly satisfactory.

# FOR BIG TRAP CAPACITY IN A SMALL PACKAGE

...buy Armstrongs

SIZE FOR SIZE THEY GIVE YOU MORE



FROM THE RIDICULOUS TO THE SUBLIME...
The monstrosity on the left is a steam trap ence manufactured in Germany. It weighs 116 lbs. but has no more capacity than the 10½ lb. Armstrong trap on the right. All of which is a means of focussing your attention on the importance of a steam trap leverage system. The size of the big trap is necessary due to its crude-by-comparison leverage design.



ARMSTRONG steam trap capacity is a bargain size for size because of the patented leverage system. In an Armstrong trap for 100 psig, leverage is higher than in one for, say, 15 psig. Thus, a larger valve can be opened than would be possible if the leverage was the same for all pressures.

That sounds simple, but isn't. If higher leverage is secured with a longer lever arm, a bigger trap body is needed. That's the trouble with the elephant shown at the left. Also the design must permit the valve to open wide or it will restrict the orifice, reducing capacity. Armstrong's design answers these problems better than any other design.

P. S. When comparing traps be sure capacities are based (as are Armstrongs) on actual tests with condensate at steam temperature. No other basis is reliable. ARMSTRONG MACHINE WORKS, 806 Maple St., Three Rivers, Michigan.



The 36-PAGE STEAM TRAP BOOK gives dimensions, weights and actual capacities of Armstrong traps. Write for a capy or Call your local Armstrong Representative.



ARMSTRONG STEAM TRAPS

comes very dirty, it can be washed in clean water with a good neutral soap without any appreciable damage. If left dirty, gritty materials may work in among the fibers causing unnecessary abrasion—corrosive materials may cause chemical damage.

After a rope has been wet, it should be carefully dried before storing in an enclosed area. A dry, unheated room or shelter with a free air circulation is the best place to store rope. It should not be piled on a concrete floor or anywhere so that free circulation of air through the coils is prevented. Under certain conditions of temperature and moisture, mold and mildew organisms will attack the cellulose of which the rope fiber is composed, causing deterioration. Not all molds cause rope deterioration but there are enough that do, so that any mold growth should be viewed with suspicion. If the rope is not too long, it is best hung on wooden pegs in loose coils, but if it is large and heavy, storage on a slatted platform and not too regularly coiled, will prevent any danger of mildew or mold deterioration.

Do not try to after treat your rope in any way, either with oil or preservative. If you need a rope protected against definite types of micro-organisms, the manufacturer doubtless has a rope properly treated at the time of manufacture and it is much better to purchase the rope all treated than it is to try to after treat. Rope, when manufactured, contains sufficient oil and other lubricants to last throughout its life. Any attempt to add these materials to the finished rope usually results in a slippery surface which is dangerous to handle and liable to pick up sharp deteriorating particles. It is very difficult to obtain penetration to the center of a rope by any type of after treatment.

#### **Protective Treatments**

There are some places where protective treatments are necessary. Fishing ropes, or other marine ropes continually in the water need some treatment to protect them from biological attack. Most rope manufacturers have rope es-

pecially treated to protect them on this type of service.

Should the rope be used under conditions where it may become damp, and then must be stored in a confined space before drying, a protective treatment is a safeguard against mold and mildew deterioration. This condition is often called dry rot. Public Utility crews carrying rope on trucks often encounter this condition. Contractors sometimes store rope in closed boxes when on temporary work. If conditions of humidity and temperature are right, rope can be damaged in a very few days. Ropes with special treatments are manufactured for this type of service.

Rope should always be protected from chemicals. Both strong acids and alkalies deteriorate rope very rapidly. Some of the quick drying oils such as the paint oils also tend to cause rope deterioration. If cordage must be used where contamination from acid, acid fumes, or alkalies is liable to be encountered, extra precaution should be taken, or one of the synthetic ropes should be used. Saran is the most practical chemical resistant rope we know. It is substantially unaffected by either acid or alkalies. Orlon has excellent acid resistant qualities but should not be used around alkalies. Nylon has good alkali-resistant properties but is deteriorated by acid.

### Handling

When removing new rope from a coil, be sure that a righthanded rope comes from the coil in a

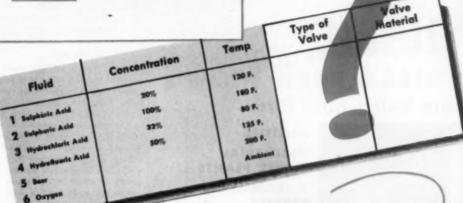
### Rope Sizes and Strengths

Here are the standard sizes, weights and minimum breaking strength of both Manila and Sisal rope. Specifications are for three-strand rope with standard lay. To figure safe loads use at least a 5 to 1 safety factor. Standard colls—50 lb and 25 lb for 6, 9,

and 12 thread rope. 200 fathoms and 100 fathoms for all larger sizes. Length in fathoms and size by circumference is the customary way of measuring large rope. Smaller sizes are ordered by number of threads. One fathom equals six feet.

	HOMBIAL SE	M.	HET WEIGHT	MINIMALIMA		MPRMUM BREAKING STRENGTH		
THREADS	CIRCUIA- PERENCE	DIAMETER	OF 100 PEET	ONE POUND (NET WEIGHT)	APPROXIMATE GROSS WEIGHT FULL CORS	PLYMOUTH SHIP BEAND MAHELA	PLYMOUTH SISAL	
	Inches	Inches	Pounds	Feet	Pounds	Pounds	Pounds	
6-Fine	%	3/4	1.47	67.9	50	450	360	
6	34	34	1.96	51.0	50	600	480	
9	1	%	2.84	35.2	50	1,000	800	
12	11%	36	4.02	24.9	50	1,350	1,080	
15	134	Na	5.15	19.4	63	1,750	1,400	
18	136	196e	6.13	16.3	75	2,250	1,800	
21	11/2	1/2	7.35	13.6	90	2,650	2,120	
	134	164	10.2	9.80	125	3,450	2,760	
	2	36	13.1	7.65	160	4,400	3,520	
	254	36	16.3	6.12	200	5,400	4,320	
	21/2	1964	19.1	5.23	234	6,500	5,200	
	234	36	22.0	4.54	270	7,700	6,160	
	3	1	26.5	3.78	324	9,000	7,200	
	334	11/4	30.7	3.26	375	10,500	8,400	
	31/2	11%	35.2	2.84	432	12,000	9,600	
	3 34	154	40.8	2.45	502	13,500	10,800	
	4	15%	46.9	2.13	576	15,000	12,000	
	41/2	11/2	58.8	1.70	720	18,500	14,800	
	5	156	73.0	1.37	893	22,500	18,000	
	51/2	136	87.7	1.14	1,073	26,500	21,200	
	6	2	105.	.949	1,290	31,000	24,800	
	61/2	21/6	123.	.816	1,503	36,000	28,800	
	7	214	143.	.699	1,752	41,000	32,800	
	71/2	21/2	163.	.612	2,004	46,500	37,200	
	8	2%	187.	.534	2,290	52,000	41,600	
	81/2	2%	211.	.474	2,580	58,000	46,400	
	9	3	237.	.422	2,900	64,000	51,200	
	91/2	31/6	264.	.379	3,225	71,000	56,800	
- 1	10	314	292.	.342	3,590	77,000	61,600	
	11:	31/2	360.	.278	4,400	91,000	72,800	
	12	4	426.	.235	5,225	105,000	84,000	

# YOU SPECIFY ...



In several of these cases other body materials or diaphragms would serve as well. But the really important fact is the unmatched versatility of Grinnell-Saunders Diaphragm Valves in handling corrosive fluids, gases, compressed air, food and suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are problems.

Grinnell-Saunders Valve bodies are stocked in cast iron, malleable iron, stainless steel, bronze, and aluminum, with other materials available on special order. Valve bodies can be lined with lead, glass, natural rubber or neoprene. Diaphragms are available of natural rubber and a number of synthetics to suit particular service conditions.

The Grinnell-Saunders Valve Division will be pleased to submit recommendations upon receipt of complete information covering service conditions.

### Features of the Grinnell-Saunders Diaphragm Valve

- diaphragm absolutely isolates working parts from fluid
- diaphragm lifts high for streamlined flow in either direction
- diaphragm presses tight for positive closure
- body, lining and diaphragm materials to suit service
- simple maintenance—diaphragm easily replaced



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## more and more Pacific

### BOILER FEED PUMPS

are being built for



UTILITIES
INDUSTRIAL
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Pacific Steam Turbopump

Typical Utility Soiler Feed Pump Installation

Туре	Quantity	Per Hour	Degrees Temp. F.	Pressure
STEAM TURBOPUMPS	12 Pumps	31,600	250	810
ABF CENTRIFUGAL PUMPS	3 Pumps	358,120	220	1300
	4 Pumps	350,000	300	1060
	4 Pumps	455,000	336	1225
IBF CENTRIFUGAL PUMPS	3 Pumps	425,000	310	1825
	3 Pumps	495,000	306	1619
	6 Pumps	405,000	305	1750
	6 Pumps	405,000	305	1750
	3 Pumps	430,000	310	1825
	6 Pumps	550,000	334	2200
JBF CENTRIFUGAL PUMPS	2 Pumps	163,600	260	490
	1 Pump	117,500	250	775
	30 Pumps	95,000	250	810

PACIFIC Precision, Built PUMPS Offices and Service in All Principal Cities

### Pacific Pumps inc.

HUNTINGTON PARK, CALIFORNIA Export Office: Chonin Bldg., 122 E. 42nd St., New York counter-clockwise direction. In most instances the coil should be laid flat with the inside end on the bottom and the end of the rope should then be pulled up through the center of the coil. A left-handed rope should unwind in a clockwise direction. Do not drag a rope behind a vehicle to remove excess turn. This adds to the surface abrasion, is inclined to work foreign matter into the body of the rope, and it may remove more turns than is necessary.

### Repairs

When rope must be joined or repaired because of a cut or break, always splice rather than tie a knot. Practically all knots reduce rope efficiency by about 50%, that is, the strength at the knot is only one-half the strength of the rope. A good short splice has an efficiency of approximately 95%. A well made long splice has an efficiency of about 90%. Splices are simple to make and a well repaired rope is practically as good as new for most purposes.

For ordinary tackle work, a well made long splice is the practical way to join a rope. The rope moves slowly and the loads are usually not excessive. When high speed power transmission is involved, or when continual surface friction is encountered, such as a ski-tow rope, the common long splice should never be used. There are very special splices for this type of work and special instructions for making them can be obtained from most rope manufacturers. These special splices do not increase the strand diameter at the tucks and thus prevent localized surface wear.

### Plant Uses

Most common uses of rope are to secure two objects together, to provide a means of attachment to some power for moving an object, or for hoisting work where the power applied to a load can be multiplied by the use of tackle blocks.

When used for holding objects in permanent positions, there is little danger of rope distortion to a degree which will cause trouble.

(Continued on Page 112)

# Now. get better results from poor fuels!

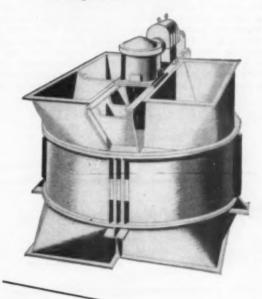
Problems presented by today's available fuels hold fewer complications in those boiler plants equipped with Ljungstrom Air Preheaters.

High temperature combustion air is the key factor to efficient combustion of low-grade fuels, especially coals with high ash or moisture content. With the Ljungstrom Air Preheater it is possible to obtain higher preheat more economically.

In addition, the continuous regenerative counterflow principle of the Ljungstrom permits reliable operation at low exit gas temperature. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

If you are planning a new installation, or modernizing your present one, our engineers will welcome the opportunity to show you how the Ljungstrom can enable you to get better results from low-grade, less costly fuels.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.



### THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.



### New Design for Slag Screen Tubes

By L. L. PITTS

POE a number of years the sing section tubes in one boiler at Plant Atkinson. Georgia Power Company, were periodically damaged by large deposits of sing that formed on the furnace water walls and then fell on the acrosen tubes. The force of the falling sing bent the tubes and loosened them in the headers, thus causing lesks which sometimes were bad enough to force an outage of the unit.

The original inetallation had 8" O.D. sleg screen tubes with a wall thickness of 150". The tubes were arranged in two elevations as shown in the drawing. One row was 15" above the other, the tubes being staggered to give a hori-

zontal distance of D.," between tube centers (see sketch).

To correct this condition a new design was worked out with the factory engineers (as shown in the drawing), using 3" O.D. tubes with a wall thickness of 220°. The tubes were re-arranged in two elevations as formerly, but instead of being staggered the lower tubes were set 5" below and directly beneath the upper tubes. This gave a horizontal distance between tube centers of 101/4", with the exception of one space in the center of the furnace that was 201/2" between tube centers. To give the tubes more rigidity steel lugs 2" x 2" x 3," were welded between the

tubes every 2.4°. After the new tubes were rolled in the headers they were seal welded on the outside of the headers.

This change is design of the siag screen in this holler has been tery astisfactory. When large pieces of siag fall the new screen tubes have enough rigidity to break up the siag instead of beneing down as they formerly did and the larger openings between the tubes allow larger pieces of slag to fall through into the ask hoppers. The necessity for shutdowns of this unit to straighten and revoll siag screen tubes has been eliminated.

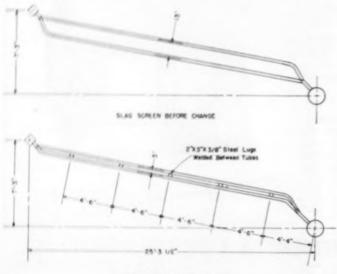
### Hints on Use of the Cutting Torch

MAINTENANCE men and welders may find the following helpful in using the cutting torch.

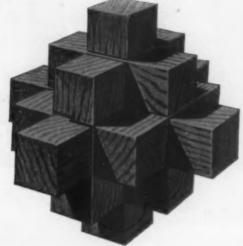
A smooth cut can usually be made if the heating flame is kept to the proper size. The flame should be small. However, care should be taken to avoid having the flame too small, otherwise the torch may back-fire. If the flame is too large the outer edges of the cut are likely to melt, and result in a rough cut instead of a smooth one.

In cutting round stock, better results may be secured if the line where the cut is to be made is first chipped with a chisel. This offers a better "bite" for the cutting torch, making it possible to start the cut quicker, and easier; and a much smoother cut can be made.

If an emergency arises, and it becomes necessary to make a cut in a hurry on material, covered with scale, paint, etc., difficulty will be experienced if the heating flames are made longer than ordinarily would be used; and if a short flame is used the small particles against the end of the torch nozzle will interfere with the progress of the cut. Therefore, if time permits, the rust, paint, or scale along the line of cut should be loosened by passing the flame over them and scraping before the actual cutting is started.-LEE BRADY.



## Water problems interlock



In virtually every plant, all water problems are so complexly interwoven that no one of them can be solved without reference to the others.

Solutions of a sort may be relatively easy, but you want that specific group of inter-related procedures which — weighing results against investment, operating expense and maintenance cost — represent the most efficient and economic solution to the problems in your plant.

You get this from Hall Laboratories for Hall is equipped, through years of experience and continuing research, to deal with all types of industrial water problems – selection of sources, treatment of plant water supply, boiler water conditioning and other problems in power generation, industrial process waters, waste recovery and disposal.

Hall Plant-Wide Water Service is your assurance that your water problems will be considered both individually and as a whole. May we send you a copy of our new bulletin "Let's Consider Your Whole Water Problem"?

Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

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BOILER WATER CONDITIONING

PROCUREMENT, TREATMENT, USAGE AND DISPOSAL OF INDUSTRIAL WATER



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Frank D. Neill

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Lubriplete Lubricants set new high standards: They reduce friction, wear and power consumption. They prevent rust and corrosion of bearings, parts and product. They last longer than ordinary lubricants. LUBRIPLATE

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THE MODERN
LUBRICANT

## A Tough One and

### How We Solved It

FOR two discouraging weeks we had circulated oil through the piping of a new turbine. Hopefully we examined the strainers every few hours but dirt and rust still collected. The owner fairly oozed impatience as he chafed to see the machine started and earning its keep. You'll appreciate the fact that we were open to ideas and one came along which sounded good. Why not run a small air driven tube cleaner through the branch lines from the bearings to the header? Since we had tried about everything else we saw no reason for passing this up.

The cleaner with a single cutter shaft was started down the branch line between No. 3 bearing and the header and when it got about five feet from the bearing we heard the steady rattle of the cleaner change to an abnormal knocking sound. The cutter head had gone to pieces and we roundly cursed the idea as we examined the broken stump hanging from the tube cleaner. What to do now?

Should we leave the pieces of cutter in the line? There never would be enough oil velocity in the line to carry them to the bearing. Or would there be? How would we get them out seeing that the piping was all welded together?

A council of war ended in our deciding to recover the pieces somehow. We reasoned that they were most likely resting in a certain straight horizontal run of branch pipe and not over six or eight feet from the supply header.

With a hole saw we cut a 1¼" hole in the supply header directly opposite the branch line. Thrilled we were to see pieces of the cutter lying in the line. (We were expecting to find five pieces.) The question then was how to get them out without losing them in the supply header.

Another hasty huddle and we hit on the idea of a small electric magnet which was soon made up. With the magnet and its lead wires



This comparative test of a Homestead-Reiser Valve and two other well-known lubricated plug valves showed that the Homestead-Reiser Valve remained drop-tight through twenty-two times more operations than Valve "A" without re-lubricating, and through three times as many operations as Valve "B". That means that Homestead-Reisers require less attention, and give greater economy of lubricant.

Prove the superiority of Homestead-Reiser Valves to your own satisfaction, by installing a few in your plant, side by side with any other lubricated plug valve. They may be had in both semi-steel and cast-steel, sizes ½" to 12" for

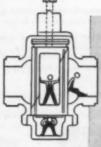
steam working pressures to 150 pounds, or oil-water-gas to 200 pounds.

Write for new catalog 39-5, and for prices on your requirements.



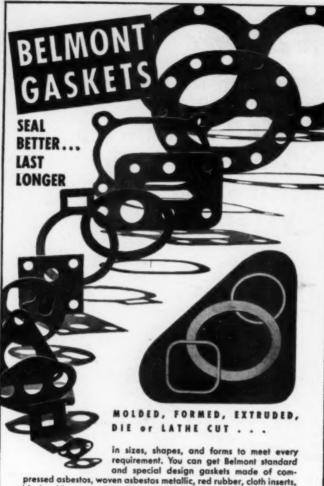
P. O. Box 70

CORAOPOLIS, PA.



### "Self-Seeld" MEANS

... that in addition to a full-port lubricant seal, the wedge-action of the plug under line pressure forces the finished surfaces of the plug outward, and constantly presses them against the seating surfaces of the body, thus keeping them always in intimate contact. The plug automatically adjusts itself for wear, assuring extra long life, maximum leakless service, and lubricant economy.



pressed aspestos, woven aspestos metallic, red rubber, cloth inserts, black rubber, vegetable fibre, cork-vegetable fibre, gray rubber, neoprene, and a wide variety of compounded materials.

And, Belmont complete manufacturing facilities assure dimensional accuracy, uniform thickness and top quality finish.

Whether your gasket problem is ... temperatures ... pressure ... vibration ... shock ... oxidation ... corrosion ... creep ... reduction or just a matter of gasket size and shape, if you want BETTER JOINT AND SURFACE SEALING ... longer gasket service life — TRY BELMONT.

Distributors located in every large industrial center to serve you. Write for catalog #40.

. . . And, there's a Belmont Packing for Every Service.

## THE BELMONT PACKING AND RUBBER CO.

Butler and Sepviva Streets
Philadelphia 37, Pa



FOR STEAM, WATER, OIL, GAS, AIR, ACIDS, ALKALIES, AMMONIA.

RINGS, SPIRALS, COILS, REELS, SPOOLS, SHEETS, GASKETS

fastened to an electrician's wire pulling "snake" we went fishing through the hole. In the next ten minutes and five "casts" we retrieved not five but seven pieces of the cutterhead which mated perfectly to the broken stump of the tube cleaner.

It was a small job to tap the "fish hole" for a plug and seal weld it. Not long after that we got the system free of dirt and when the machine went smoothly on the line the owner's blood pressure went back down as the pointer of the power meter went up.—JACK TOTTEN.

### Bull Gang Cuts Change-Over Time

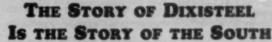
### By TOM DAVIS

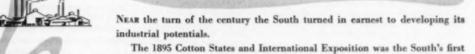
Maintenance Department Rock Hill Printing & Finishing Co. Rock Hill, South Carolina

INSTALLATION of new machinery and the change-over and relocation of existing equipment without the loss of production poses a major problem in many industrial plants. Peak production periods have been so lengthy during the past two or three years in certain branches of the textile industry that some plants could not delay until "slump weeks" to make necessary installations or revisions of high production machines. These changes must be made on week-ends and the units must be in operation by starting time on Monday morning.

The Rock Hill Printing and Finishing Co., a division of M. Lowenstein & Sons, Inc., has solved this problem by employing a special crew for just this type of work. This new construction crew or "Bull-Gang", as it is known at Rock Hill, is made up of men in the Mechanical Department, under the direction of the Plant Engineer. Skilled mechanics, pipe and steam fitters, sheet







major bid for new industry.

It wasn't too long afterwards that Atlantic Steel Company was founded, and it is significant that even today one of that exposition's original buildings is used as one of our warehouses and is located in the very heart of our

200-acre plant.

How well the growth and progress of Atlantic Steel Company parallels the growth and progress of the South is best brought out in the new book, The Story of Dixisteel, written by Charles F. Stone, Chairman of our Board of Directors, and published as part of our 50th Anniversary Celebration.

### ATLANTIC STEEL COMPANY . ATLANTA, GEORGIA

PRODUCERS OF FINE-QUALITY LOW-CARBON STEEL PRODUCTS, INCLUDING: HOT ROLLED BARS, SHAPES AND STRIP—DRAWN WIRE—NAILS, RIVETS, STAPLES—FENCE AND BARBED WIRE—FORGINGS AND STAMPINGS



With Prat-Danîel Dust Collectors, an extremely high percentage of the ultra-fine particles are removed from the gas stream. Long, narrow inlets on tubes of small diameter produce high efficiency even at reduced loads. The low velocity reduces erosion and combined with wear-resistant steel construction gives P-D collectors the desired combination of high efficiency and exceptionally long life.

All types of P-D Collectors meet the requirements of most dust ordinances; the high efficiency of the Valmont Type S, however, exceeds the requirements of many of the most stringent ordinances.

"Uni-block" construction, with complete tube sections assembled at the factory, makes relatively low installation costs possible. Hundreds of installations have proved P-D Collectors' all-'round efficiency and low maintenance costs provide a high return on investment. Get the best in dust collectors for your plant.Writeour Sales and Project Engineers for Catalog No. 250S.



#### UNIT RESPONSIBILITY

Prat-Daniel, through its sales and project engineers, The Thermix Corp., offer a complete complement for handling the air gas stream shown at left; 1. Forced Draft Faris, 2. Air Preheaters, 3. Tubular Dust Collectors, 4. Induced Draft Fans and 5. Fan Stacks. This unit responsibility, by a well-known firm, relieves the engineer of the responsibility for one of the most important functions in a steam generating plant.

Sales and Project Engineers

### THE THERMIX CORPORATION

GREENWICH, CONN.

Canadian Affiliates: T. C. CHOWN, LTD. 1440 St. Catherine St., W., Montreal 25, Quebec 50 Abell St., Toronto 3, Ontario

Designers and Manufacturers

PRAT-DANIEL CORPORATION

SOUTH NORWALK, CONN

metal workers, machinists, and electricians combine their talents in a concerted effort to keep downtime to a minimum on new installations or relocations.

Competent lead men are in charge of the particular bull gang used on each job. Mechanics and helpers are assigned strictly to this type of work, while pipefitters and electricians are drawn as needed from the regular plant crew.

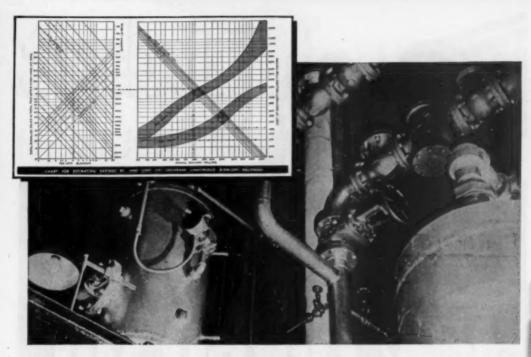
Practically every new type of machine used in cotton and rayon printing, finishing, and dyeing has been installed at Rock Hill, and 90 per cent of these installations have been made by the bull-gang system.

In installing a new machine, the procedure is for the drafting room to survey the location of the machine and make a layout of the area. They prepare a drawing showing the location and details of the machine based on manufacturer's blueprints.

Copies of these layouts are given to the foremen of the construction gang, electricians, pipe fitters, and yard department which handles all excavation, concrete, and brickwork. These foremen lay out their respective jobs, discuss important phases with their lead men, and generally prepare for their part of the job.

As much of the preliminary work as possible is done before the area is turned over to the bull-gang for actual installation. This preliminary work consists of sub-assembly of the machine units into easily handled sections, fabrication of piping stacks, laying of foundations, making up rolls, shafting, and sprockets in the machine shop, and mounting of auxiliary equipment and controls.

Everyone concerned is ready to go to work when the time comes for actual installation on a Saturday morning at 7 AM when the plant is shut down for the weekend. Center lines are laid, and drains are fitted in the excavations made by the yard crew. Meanwhile, the electricians are making conduit runs and have started pulling wire, installing controls, and mounting motors. After all under-floor work is completed, the sub-assemblies are



### **COCHRANE CONTINUOUS BLOWOFF**

If you are using old-fashioned methods of blowing down boilers intermittently, you can save heat, save fuel, save money, maintain uniform boiler concentrations—and get your money back inside a year—by installing a Cochrane Continuous Blowoff System.

The savings are due, first to heat recovery by utilization of steam flashed from the blowoff and by directing the hot waste water (remaining after flash) through a heat exchanger. Uniform boiler concentrations, another result, mean smoother boiling conditions, cleaner steam.

Chart shown above, for estimating savings is included in Publication 4410 a copy of which will be sent you.

COCHRANE CORPORATION 3110 N. 17th St., Phila. 32, Pa. is Canada: Canadian General Electric Co., Ltd., Teresta

In Mexics: Babcack & Wilcox de Mexico, S.A., Mexico City - In Europo: Recoveration Thermique & Epuration, Paris

COCHRANE

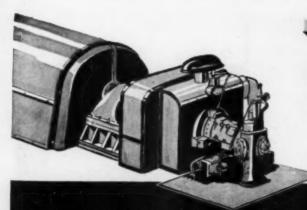
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Die L. A. Mil

SAVES HEAT
SAVES FUEL
SAVES MONEY

31	ochrane Corporation 10 N. 17th St., Philadelphia 32, Pa.
44	ease send me a copy of your Publication IIO, containing chart for figuring savings Continuous Blowoff.
Ne	me
Fu	m
Ac	idress
CI	tyZone State





Todays

# Improved SHELL TURBO OIL

"LOOK AT THESE RUST-PROTECTION FIGURES"

	100	200	300	400 (SQUARE	500 CM. OF STEEL	600 PROTECTED)	700	800	900
SHELL TURBO OIL	100000					*********			****
OIL "A"					-				
OIL "B"	-								
OIL "C"					t steel stele is	immersed to			
OIL "D"					nixture of the	all under test,	distilled water	and eir. It is	kept
OIL "E"	-			;	uccessive du	ours. If no rust plicate strips are added: I Non	until rust she	ws. The area	s of

Improved SHELL TURBO OIL for

# Surest Safeguard for MAJOR TURBINE INVESTMENT

# The one lubricant that provides this outstanding 5-way protection

Because of the tremendous responsibility entrusted to operators of large steam turbines, and because of the heavy investment each unit represents, Shell Oil Company has been concentrating on a lubricant research project of primary importance to utility and industrial executives.

The product now offered, Improved SHELL TURBO OIL, exceeds every accepted specification for premium turbine lubricants. It offers these five outstanding improvements:

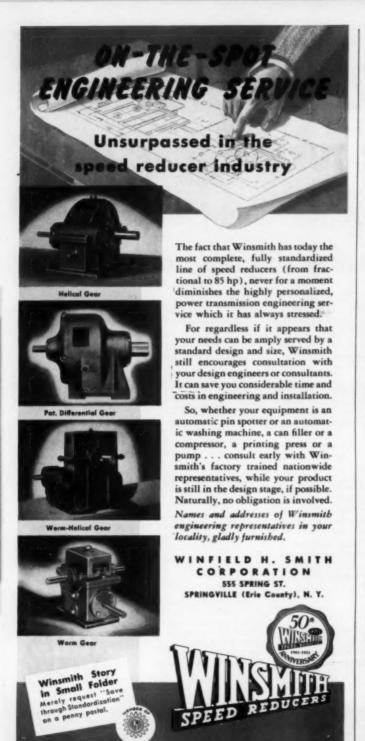
- Highest known rust protection—An entirely new combination of rust inhibiting additives effectively retards the formation of rust—an action which with proper maintenance will continue for the life of the turbine. Rusting problems are reduced to the very minimum in any turbine protected by Improved Shell Turbo Oils.
- 2. Outstanding Oxidation Stability—Improved Shell Turbo Oil contains the same time-proved anti-oxidant which has compiled such an extraordinary record of oxidation stability in the original Shell Turbo Oil. Service records for turbine units of all sizes... many operating for 10 to 13 years... show complete stability with respect to oxidation and sludge formation. In each of these units the oil gives every indication of matching the operating life of the turbine itself.
- Anti-fooming—With the effective anti-foam agent now in Shell Turbo Oil, air entrainment can be tolerated for considerable periods, thus avoiding unscheduled shutdown.

- 4. Excellent Emulsion Characteristics Improved Shell Turbo Oil provides the greatest protection against rust and oxidation yet achieved. Moreover, this protection is attained without any tendency to form objectionable water emulsions in service.
- 5. Protection against wear—The specially developed rust inhibitor used in Improved Shell Turbo Oil has the added faculty of reducing surface wear... adding to the protection afforded by the Oil itself. Because of this "anti-wear" effect, Shell Turbo Oil provides a welcome margin of safety for the bearings and gears during the critical starting and stopping periods.

Samples and complete information on the Improved Shell Turbo Oil will be sent promptly on receipt of your letterhead request. Address: Shell Oil Company, 50 West

50th Street, New York 20, N.Y. or 100 Bush Street, San Francisco 6, Calitornia.

central station and industrial turbines



moved into position and secured, the pipe and steam fitters mount their piping and make tie-ins to headers and return lines. The sheet metal men come in and mount the hoods and complete the ductwork, and curb and drain forms are built and the concrete poured and finished.

Circuits are checked out, the machine units synchronized, and after a thorough lubrication of all moving parts, a tough trial run is made to permit belt adjustment and other final checks.

The concrete formwork is stripped in 12 to 24 hours, and the machine is ready to go into production at 7 AM on Monday. This system has been so successful that there is the barest minimum of down-time experienced in change-overs.

The bull gang is made up of skilled men working with a fine sense of comradeship and pride in a hard job well done. The management is proud of the work these men are doing. It is personal effort and skill of this sort which has helped make Rock Hill Printing & Finishing Co., one of the largest plants of its kind in the world.

### **Electrical Maintenance**

ONE of the most important things that the maintenance staff can do is to select the proper equipment and material for the job.

### **Braided Wire**

In grounding machinery to the conduit grid system and particularly where vibration is concerned, it is wise to use copper braid which is highly flexible and will withstand extreme vibration over long periods of time. Copper ribbon nearly always makes a better looking job but will not withstand vibration.

The use of stranded wire is advantageous in many locations where vibration and reciprocating motions are encountered. In the textile industry the use of stranded wire for stop-motion purposes is a standard practice;

# THERES PROOF!

### Boiler rooms are QUIETER, CLEANER, SAFER, with SUPERIOR'S Built-in, INDUCED Draft.

Superior's Induced Draft prevents the escape of combustion gases into the boiler room even through an open port. For our photo shows one of our engineers observing the fire through the wide open pressure-relief port.

It also explains one other distinct advantage of induced draft. The fact that the fire is pulled through each successive pass without impingement and wear on refractory as is the case under forced draft. For that relief port is at the end of the first pass where the combustion gases are turning the corner into the second pass. If they weren't being led, some of them would find their way out through the open port.

Greater quiet; longer trouble-free aperation; cleaner, more healthful atmospheres are other primary results. We can't tell you the whole story here, but you'll find it all in our new catalog. Write today to reserve your copy of the newest edition. Ask for Catalog 311

SUPERIOR COMBUSTION INDUSTRIES, INC.

TIMES TOWER, TIMES SQUARE, NEW YORK 18, N. Y.





For Orifice Meters, Regulators, Gage Lines, Instrument Panels, Christmas Trees, By-pass Lines, etc.

HERE'S A NEW DESIGN in instrument valves — forged steel for strength in high temperature or high pressure service; no bonnet joint, swing bolted gland for easy packing adjustment.

Compact enough to fit the limited spaces of panel boards, this new Edward instrument valve is especially designed for close regulation on meter and regulator lines, too.

Built in globe or angle design, screwed

or socket welding ends, ¼ in., ¾ in., and ½ in. sizes. Working pressure ratings 6000 lb WOG, 1500 lb at 850 F with carbon steel bodies, and 1500 lb at 1000 F with 13 per cent chromium EV alloy stainless steel bodies. Write today for Bulletin 491,

FIG. 952 SERIES

ACTUAL VALVE SIZE

EDWARD VALVES, INC. 122 West 144th St., East Chicago, Ind. 122 West 144th St., East Chicago, Ind. 1910 Please send me Builetin 49 1—on Fig. 952 Series

rebany - Zo

City

Another Product

Subsidiary of ROCKWELL MANUFACTURING COMPANY

NY D

however, today stranded wire may also be acquired in neoprene insulation which is very flexible and offers high resistance to oil and grease

### Keep Water Out

In many cases I have noticed flexible conduit installed in such a manner that any oil travel on the surface would be immediately led into the flexible conduit whereas if the conduit were reversed, so that the spiral is downward, it would shed oils to the outside

The use of floor boxes with gaskets and lids may be improved upon by the use of a loop system of wiring. In this method the conduit is turned up out of the floor and terminates some six inches above the floor in such a manner that it is almost impossible for water and oils, etc. to enter the conduit. In many cases where floor boxes and junction boxes are installed in the floor, water from any floor scrubbing process may enter through a faulty gasket. We eliminate all junction boxes in floors and run directly from the loop-system network to the distribution panels, thereby eliminating these hazards.

### Megohm Meter

Megohm meter readings are extremely helpful in determining whether or not the insulation on the wire system is deteriorating. Such readings are also extremely important to determine the condition of motor windings, particularly where the higher voltages of 550 to 2300 are used.

### **Motor Protection**

The use of insulating compounds for the protection of motor windings is of great importance particularly where moisture is present to any appreciable degree, such as in saturated air streams etc. These insulating compounds may be acquired from the various electrical manufacturers and are sold under various trade names. They offer high resistance to moisture and erosion and yet do not affect the dissipation of heat from the equipment to any appreciable degree .- G. F. BENN, NORTH CAROLINA.



### 2 BRONZE SEATS

No question about it, Darts are made to give extra value much more for only a little more. Take the seats! They're both made of non-corroding bronze to give resilience and top resistance to corrosion and pitting.

### A TRUE BALL JOINT

Then to give perfect contact - the wide-bearing area that locks out leaks - each is precision-machined. And, finally, spherically ground.

### HIGH TEST MALLEABLE IRON

The nut of a Dart - as well as both ends - is made from practically indestructible, high test, air-refined malleable iron. It's your guarantee of top resistance to stress, stretching and wrenching.

Insist on Darts. You'll find they cost less in the long run.

### DART UNION COMPANY

Providence 5, Rhode Island The Fairbanks Co. - Distributors Boston New York Pittsburgh





# reduces costs... maintains Quality remium Quality

## B&W STEAM

Local unwashed Illinois coal is \$1.10 a ton cheaper than the higher, washed grade formerly required by the Falstaff Breweries' natural draft stokers. When a new B&W Integral-Furnace Boiler, Type FF was installed in their St. Louis plant No. 5, Falstaff enjoyed an initial saving of 25% on fuel costs.



Most recent of six B&W Integral-Furnace Boilers, installed in Falstaff breweries at St. Louis, Omaha and New Orleans.

And that wasn't all... with the new B&W unit, they squeezed more efficiency from the cheaper fuel by increasing the rate of evaporation from 6.6 pounds of steam per pound of coal to 8.4 pounds ... bringing fuel savings to a total of 45%!

Sudden load surges typical of brewery requirements are met with ease. Steam loads can be increased 15 to 20% within a matter of seconds without carryover or loss of pressure. Whatever your business, the use of B&W's 80 years experience in boiler improvement is sure to be appreciated by your plant engineers and cost accountants. The Babcock & Wilcox Co., 85 Liberty St., New York 6, N.Y.



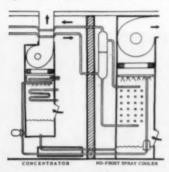
G-578

### **NEW EQUIPMENT** for Southern Industry

### Spray Cooler and Concentrator

G-1 NIAGARA BLOWER COMPANY,
405 Lexington Ave., New
York 17, N. Y., has introduced new "No Frost" equipment for
refrigerating cold test rooms, cold
processing, and cold storage.

The equipment consists of the spray cooler which provides a controlled cold air system at sub-zero temperatures by means of passing air over refrigerated coils that are prevented from accumulating ice or frost by a constant spray of a non-freezing liquid compound. In ofder to keep this process automatic and continuous, the liquid is maintained in a concentrated condition by constantly removing the moisture that is condensed out of the atmosphere by contact with the refrigerated spray. This is done by means of a concentrator.



The new concentrators are manufactured in a wide range of sizes with water evaporating capacities ranging from ½ gal to 75 gph. A single large concentrator will serve a battery of several large spray coolers.

### Power Feeder

G-2

THE RAPIDS-STANDARD COMPANY, INC., Dept. PFA, 342
Rapids, Mich., has introduced a power
feeder for their inclined power belt
conveyor.

The new power feeder, which connects to the lower end of the conveyor, handles very short or long articles that might not transfer smoothly from gravity feeders. Pitch of the power feeder need not be adjusted when direction of flow is reversed.

The unit, manufactured in two widths to fit 10-in, and 16-in, belt

Free additional information is available to readers of Southern Power & Industry. Check item number on the postage free service coupon post card—page 17.

width Floor-Veyor, Jr. units, may be attached easily to models already in use. Standard overall length of the feeder is 30 in., with longer models available for special handling problems.

### Electric-Power Truck

ELWELL-PARKER ELECTRIC Co., 4205 St. Clair Ave., G-3 Cleveland 3, Ohio, has announced a new model electric-power industrial truck which combines low truck weight with relatively high load capacity. A fork truck requires counterbalancing, while a platform truck having forward wheels and axle does not need to be counterbalanced, hence its load capacity is proportionately higher. The new truck is useful in many materials handling operations, especially in older loft buildings and factories where weight restrictions apply to floors, ramps and elevators.

The basic truck is similar to the company's high-lift platform trucks. The load supporting member is attached to the elevating truck mechanism the same as in platform trucks. Instead of a platform, however, two reinforced alloy steel arms or forks extend forward the usual length of

a platform. The forward wheels are only 6½ inches in diameter and the arms in lowered position come outside and nearly flush with the top of the wheels.

These trucks are built in according

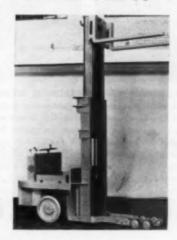
These trucks are built in several sizes with load capacities ranging from 4000 lb to 10,000 lb.

### Radio-Frequency Generator

WESTINGHOUSE ELECTRIC
CORPORATION, Box 2099,
Pittsburgh, Pa., is now
manufacturing a new, versatile 5 kw
radio-frequency generator, for industrial applications where relatively
small parts are to be surface hardened, annealed, brazed, or soldered.

The unit is designed either for production line operation, where parts are fed continuously through the heating coil, or for small-lot operation, handled on a batch basis. A single generator may be used for several kinds of work by changing the heating coil and fixture, which attaches at the front or top of the unit.

The generator features stepless electronic power output control, from one-half to 5 kw, providing operating flexibility and uniform performance on repetitive setups. It will deliver 5 kw of radio-frequency power at 100 per cent duty cycle, measured by NEMA standards. The generator is portable and easy to install.





# WHY STANDARD DP TURBINE DRIVES FIT ALMOST ANY APPLICATION

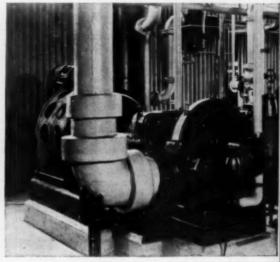
Here's a turbine designed by turbine users. It incorporates the features asked for by hundreds of operators interviewed in an exhaustive survey. They told General Electric they wanted a mechanical-drive turbine that would fit many types of applications—continuous process, standby, indoor, outdoor, equipment drive, generator drive, etc.

The DP answers these varied requirements with special features that are included as standard parts. For instance, you get hydraulic governing to meet critical accuracy requirements, totally enclosed construction that allows installation in hazardous atmospheres, pressure lubrication for dependable, continuous operation. These advantages are included at no extra cost—the DP is priced as a standard.

If you have steam available, the DP turbine can work profitably for you. You'll discover how its standard design gives you wide application flexibility, makes possible real savings in maintenance costs. The DP's operating record proves its reliability when there's a tough job to be done.



OUTDOOR INSTALLATIONS—No need to make special modifications when you move a DP out of doors. Totally enclosed governing system operating in its own oil atmosphere eliminates possibility of rusting or corrosion. You can operate a DP in hazardous atmospheres. Positive acting, non-sparking emergency governor protects the DP turbine against overspeed.



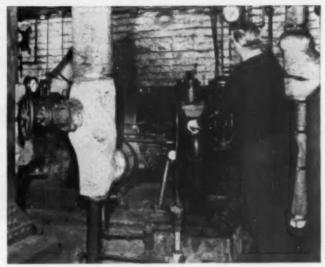
PRECISION GOVERNING—accurate enough for generator drives—is yours with the DP's hydraulic system. Regulation is 6 per cent with a 30 per cent range of speed adjustment. For process governing, regulator control is available.

Ask your General Electric representative for full details about the DP mechanical-drive turbine, or write for bulletin GEA-4955. General Electric Company, Schenectady 5, New York.

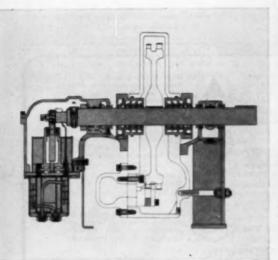




### MECHANICAL-DRIVE TURBINES



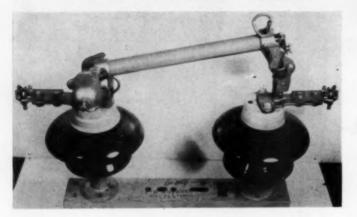
**DEPENDABILITY** is built into the DP. Positive lubrication through automotive-type bearings adds years to the life of the turbine. Special steel nozzle plate, self-lubricating graphite packings, and Monel-sprayed shaft are examples of design features that spell reliability.



APPLICATION FLEXIBILITY As the shaded parts in the diagram illustrate, most DP parts are identical an all frame sizes and ratings. In this way, you can adapt a DP for different job requirements with only minor changes. A different nozzle plate gives you a new horsepower output. A change in governor gears provides a new speed range. DP's are rated from 10 to 1200 HP and 1000 to 5000 rpm, and with slight modification, can deliver up to 2000 HP and 10,000 rpm. During a change in plant operation, the DP's flexibility will save you money.



EASY MAINTENANCE Because most parts are interchangeable on all models, spares can be stocked at low cost. A spare parts kit, containing 91 items, can be obtained with the turbine. This simple method of stocking spares lowers maintenance costs and provides protection for several DP's in your plant. All models, regardless of frame size, horsepower, or speed ratings, have identical shaft height, keyways, and coupling fits. Thus, installation problems are simplified; you can move these center-line supported units from job to job without a custom line-up.



### **Fuse Tubes**

SOUTHERN STATES EQUIP-G-5 MENT CORPORATION, Hampton, Georgia, has announced a new development in its expulsion power fuse line featuring complete voltage ratings. By simply changing or replacing the fuse tube assembly, eight combinations of continuous current and interrupting capacities are possible in each ky rating. In one operation, this fuse can be converted to meet any one of a variety of load conditions.

Another feature of the fuse line is a completely housed snubber that brings the opening tube assembly to a cushioned, shock-free stop,

The new fuses are available in 7.5 kv. 15 kv. 23 kv. 34.5 kv. 46 kv and 69 ky ratings.



### Heavy-Duty Small Drill

THE CLECO DIVISION of the REED ROLLER BIT COMPANY. 5125 Clinton Drive, Houston, Texas, has announced a new heavy-duty air-operated small drill. The new model has many features normally found on larger drills such as: stub tooth gear train, built-in lubricator, sealed spindle bearing, and a chuck guard.

The small size, 5% in. overall length and 13/16 in, from the side to the center of the spindle, contributes to easy operation in close quarters.

The manufacturer states that the drill is exceptionally useful in applications where a large number of small holes must be drilled on a production basis.



High grade gas, by-product, steam and household stoker coal from Wise County, Virginia, on the Interstate Railroad.



High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.



and by-product coal from Wise County, Va., on the Interstate Railroad. High grade, high volatile steam



The Premium Kentucky High Splint unmatched for domestic use. Produced in Harlan County, Kentucky, on the L. & N. Railroad.



Roda and Stonega from Wise LYNCO County, Va.



High grade gas, by-product, steam and domestic coal-Pittsburgh seam from Irwin Basin, Westmoreland County, Penn-sylvania, on the Penna. Railroad.



High volatile domestic, steam and by-product coal from Boone and Logan Counties, W. Va., on the Chesapeake & Ohio Ry.



Genuine Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railway.



High fusion coking coal for by-product, industrial stoker and pulverizer use from Wyoming Co., W. Va., on the Virginian Ry.

### ANTHRACITE

Hazle Brook-Premium Lehigh Raven Run-Premium Mahanoy

Capable engineering personnel and the experience gained through long and varied marketing activity assure proper application of one of the above brands and effective servicing of any fuel requirement.

### General Coal Company

123 SOUTH BROAD STREET PHILADELPHIA 9, PA.

CABLE ADDRESS, GENCO

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BLUEFIELD, W. VA. NEW YORK BUFFALO CHARLOTTE, N. C.

CINCINNATI

PITTSBURGH

## Walworth's NEW small cast steel valves

SERIES 1500 - SIZES 4 to 2 inches

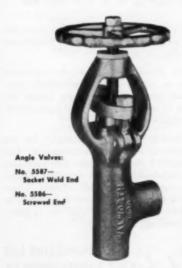
handle

HIGH

pressures

Y-Globe Velves:
No. 3385—Socket Weld Ends
No. 3584—Screwed Ends

Walworth is proud to make these new Small Cast Steel Valves available to power stations . . . oil refineries . . . ships . . . wherever piping is subject to severe pressures and temperatures. Non-shock service ratings of these valves: 1500 psi-950F for steam; 3600 psi-100F for water, oil or gas. Cast of chromium molybdenum steel, they are compact and light, yet exceptionally strong. Both Y-Globe and Angle type valves are available.



Simplified Walworth design eliminates many of the valve problems encountered in high pressure service. Among the features of this new valve are:

INTEGRAL BODY AND YOKE — made from a single casting without threading or welding. Bonnet joint — always a potential source of leakage — is eliminated. Valves can be reassembled quickly and easily.

ROTATING DISC - prevents valve seat distortion and consequent leakage. Cuts down replacements.

WELDED SEAT RING — compensates for changes in pressure and temperature—eliminates a major source of leakage.

 $\ensuremath{\mathsf{SPECIAL}}$  BACK  $\ensuremath{\mathsf{SEAT}}$  BUSHING – permits repacking the valve under pressure with greater safety.

PACKING CHAMBER — designed to dissipate heat thus keeping packing rings at lower temperatures—gives them longer life.

These valves are available with either socket weld ends or screwed ends, in sizes ranging from ½ to 2 inches. For further information on Walworth series 1500 Small Cast Steel Valves, see your local Walworth distributor, or write for Circular No. 134.

### WALWORTH

valves • fittings • pipe wrenches 60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

For more data circle item code number on the postage free post card—p. 17



### Liquid Blender

G-7

Bowser, Inc., Fort Wayne,
Ind., has developed a new
automatic proportioning
system for blending two or more of
a wide variety of liquids.

No charts or calculations are used to set the blender for any combination of liquids. Simple controls on each meter permit instantaneous setting of ingredient proportions in increments to meet the required needs.—Total throughput is recorded on a

master counter and each ingredient is recorded separately on its own meter.

Failure of any ingredient supply automatically shuts off the entire system and if the supply to any meter slows down for any reason, all meters synchronize automatically to the same rate of delivery.

Dials and gages are visible from the outside of a cabinet which encloses the entire blender. It can be equipped for operation in corrosive atmospheres.

### Large Chamber Gages

G-8

G-8

Co., 80 Fellsway, Somerville 45, Mass., has announced non-frosting large chamber gages (reflex or transparent) which include the patented gage glass extension, which prevents frost from forming over the vision slot. The gage is particularly adapted to the gaging of low temperature, light, gaseous fluids that tend to boil or surge because of the larger area at the meniscus.

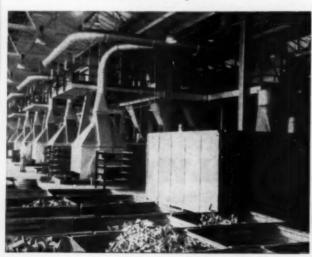
The manufacturer states that use of the new model in the chemical, petroleum, and other process indus-



tries, for low temperature ammonia, freon, propane, ethylene, and other services where low temperature fluids must be gaged, will speed up as well as materially increase the accuracy of readings. In installation, the entire gage may be covered with insulation, leaving only the outer surfaces of the patented non-frosting window extension exposed.

# 1st in Industrial Good Housekeeping... EFFICIENT DUST CONTROL

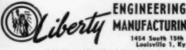
Casting shake-out booths in a leading farm implement manufacturer's plant.



 Well engineered and effective dust control is necessary to maintain cleanliness and efficient operation.

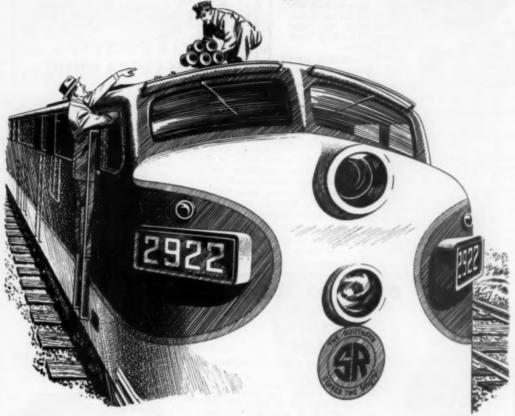
The photo shows a foundry shake-out room in which dust is effectively suppressed and removed at the source by virtue of collection both above and below the shake-out.

There is no simple "formula" for the selection of dust control equipment. For guaranteed results — just one contract, one responsibility for a complete, ready-to-operate system, consult experts. If you need a new system . . . or more capacity in an existing one, call on Liberty Engineering.



A Division of The Kirk & Blum Mfg. Co.

# We gave a HOOT about the "TOOT"!



As fast as we can, we're changing the "voice" of our Diesel locomotives. Why? Because our neighbors along the Southern told us that, as much as they liked our modern Diesels, they missed the friendly sound of the familiar steam engine whistles echoing across the country-side.

So we got busy. To replace the deep-throated blat-t-t of the original air horns on our Diesels we developed a melodious "airchime" signal that recaptures all the nostalgic sound of the old steam whistle.

A little thing? To you, perhaps...but not to us! For being a "good neighbor" to the people we serve is one of the biggest, most important things the Southern Railway System can do.

Ernest E. Rorris

SOUTHERN RAILWAY SYSTEM





# LONGE

Boiler furnaces lined with CARECO last two to four times longer than those lined with fire brick. Write for quotation.

CAROLINA REFRACTORIES COMPANY MARTSVILLE, S. C.

### FUNDAMENTALS OF BOILER PLANT ENGINEERING

(Basic Principles of Steam Plant Practice)

(Basic Principles of Steam Plant Practice)

By A. D. HOLLAND

Assoc. Prof. of Mach. Engr., Georgie School of Technology

"Fundamentals of Boller Plant Engineering"—is different from most handbooks in that it goes into the fundamental principles of boller plant perattons that the fundamental principles of boller plant perattons that the principles of boller plant perattons that the proper continuity is carry these basic laws; at the same time it apportunity tables and formulae make it a valuable reference book for the trained engineer.

tables and formulae make it a valuable reference book for the trained engineer. The basic principles covered in this book have such wide application that it will be extremely helpful to refrigeration, air conditioning, textile and hydraulic engineers and master mechanics. Stiff cover, cloth binding, 4% at 7 inches, 232 pages, 37 tables, 55 illustrations, 30 memorandum pages for your special notations. "FUNDAMENTALS OF BOILER PLANT ENGINEERING" may be secured with a 3-year subscription to SOUTHERN POWER & INDUSTRY for \$3.00. Take advantage of this special offer while it lasts. Write today to

today SOUTHERN POWER & INDUSTRY

ATLANTA S, GEORGIA

Oil Reclaimers

THE HILLIARD CORPORATION. Elmira, N. Y., has announced a new line of oil reclaimers. The new units feature improved design including rotary type pumps, high capacity regenerative heat exchanger, new vacuum pump lubricating system, and re-arrangement for ease of servicing. The reclaimers are for use in diesel and gas engines and compressors, vacuum pump lubricating and sealing oils, hydraulic oils and industrials.

### Flame Failure Safeguard

COMBUSTION CONTROL COR-G-11 PORATION, 77 Broadway, Cambridge 42, Mass., has announced a new series of Fireye flame failure safeguards and programming controls, which offer a photoelectric flame failure safeguard that can "see" all types of flames and protect against explosion.

The scanner is a new photo-conductive cell which gives instantaneous response to flame failure. The com-

pact unit is installed in a short length of 1/2-in, standard pipe located where its sensitive cell can scan the flame area. This simple scanner replaces both flame rod and photoelectric scanner, reducing installation and servicing problems to a minimum.

The scanner coupled with the new programming control monitors the complete firing cycle from pre-ignition purge through post-fire purge. It checks the pilot and the establishment of the main flame; then stands guard throughout the firing period.

### DAVIS NO. 300-S MOTOR **OPERATED** VALVE



MANY industrial plants have found that the Davis No. 300-S Motor Operated Valve solves many flow control problems on process lines, sone heating, and fire emergency shut off. This valve features: Direct connection between valve stem and 2-position motor ... 30 second timing ... 25 watt power consumption; no stand-by consumption . . . Renewable disc . . . No internal pack-. Visible position indicator . . . ing . . . Visible position indicator . . . And Davis' famous tight-closing, nonsticking, single seat, pilot stem design.

No. 300-S is available in sizes from 1/2" to 6" for various service requirements. Other designs for higher pressures and larger sizes. Bulletin on request.

### DAVIS REGULATOR COMPANY

2507 S. Washtenaw Ave., Chicago B, III.

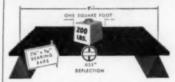
### ASK FOR NEW CATALOG A-50

AUTOMATIC PRESSURE, FLOW, AND LIQUID LEVEL CONTROLS **SINCE 1875** 



# For STRENGTH specify

### OPEN STEEL FLOORING



The locked-in strength of Tri-Lok enables it to stand up under heavy loads—even on long spans. Get maximum strength, air and light with minimum weight.

Tri-Lok is also available in Diagonal, or Super-Safety U-type Flooring, and in Stair Treads of all types. Write for Bulletin KN 1140.

The Tri-Lok Company is also equipped to furnish riveted and Tri-Forge welded open steel flooring. Tri-Lok can be furnished in a variety of metals, including aluminum alloy, stainless steel, etc.

### DRAVO CORPORATION

National Distributor for the Tri-Lok Comp

ve Bidg., Pittsburgh 22, Pa. Sales Representatives in Principal Cities



# CONSOLIDATED Maxiflow...

THE SAFETY VALVE WITH A



Only three years after Alexander Graham Bell invented the telephone in 1876, the first Consolidated Safety Valves went into service. During those 72 years, steam generating installations have changed dramatically, both in unit size and operating requirements.

Today's Consolidated Maxiflow Safety Valves embody greater discharge capacity, shorter blowdown and other characteristics demanded by high-pressure, high-temperature steam generating equipment.

Because they are new in all that modern engineering can contribute, Maxiflow Valves set a new standard in safety and service.

When you invest in Maxiflow, you get safety valves with features proved in punishing laboratory tests... proved through years of tough service in steam generating plants. For example, the Consolidated Maxiflow Safety Valve...

- Permits rapid equalization of temperature differentials because it has a thermodisc seat. Minimizes thermal stresses, prevents distortion, achieves permanent tightness.
- Assures constant enfrance conditions for steam flow because the forged mechanical through bushing has precision-machined surfaces. Eliminates leakage due to porous castings.
- Allows control of blowdown to as low as 1%.
   Exclusive "micrometer" trim ring is adjustable externally—provides a simple and chatter-proof blowdown control, operable with valve under pressure.
- Retains the popping point by combining proper compensation with materials that have low coefficients of expansion.





Get all the facts about Cansolidated Maxillow Safety Valves. Camplete capacity tables, description and features are shown in Bulletin 707. Write for a copy.

CONSOLIDATED SAFETY VALVES



A product of MANNING, MAXWELL & MOORE, INC. BRIDGEPORT 2, CONNECTICUT MAKERS OF "CONSOLIDATED" SAFETY AND RELIEF VALVES, "AMERICAN" INDUSTRIAL AND "MICROSEN" ELECTRICAL INSTRUMENTS, "HANCOCK" YALVES, "ASHCROFT" GAUGES. BUILDERS OF "SHAW-BOX" CRANES, "BUDGIT" AND "LOAD LIFTER" HOISTS AND OTHER LIFTING SPECIALTIES.

### For more data circle item code number on the postage free post card-p. 17



### Variable Speed Pulley

GERBING MANUFACTURING CORP., 11801 Milwaukee' Ave., Northbrook, Ill., is producing a new 3 to 1 ratio variable pitch pulley which is said to provide infinitely variable speed changes in the 15-hp range. The pulley is dynamically and statically balanced and uses a standard vari-speed rubber V-belt.

The exclusive rack and gear arrangement controls sheave movement and the manufacturer states that it

assures perfect belt alignment throughout the entire speed range. Further information is given in the manufacturer's descriptive literature RC1300-150.

### Ladder Stabilizer

MINE SAFETY APPLIANCES
COMPANY, Braddock,
Thomas & Meade Streets,
Pittsburgh 8, Pa., is now distributing
a new hydraulic ladder-stabilizer. The
adjustable steel attachment for the
lower end of straight or extension ladders is said to provide safe footing
for ladders in places where the two
legs would not be on the same level.

The assembly consists of two steel legs which act as plungers in vertical tubes attached to the lower ends of ladder rails. Each leg has a swiveled shoe attached to its lower end by a ball and socket joint. Each shoe, a hardened steel plate with a diameter of 3½-in., has a rubber and cord sole %-in. thick vulcanized to it. The sole, with concentric circular grooves about 3/16-in. deep, serves as a gripper on most hard surfaces.

The vertical tubes which house the legs or plungers are cross-connected near their upper ends by steel tele-



scoping valve tubes leading to a central block. The valve assembly adjusts to any ladder width between 17 and 29-in. and fits straight, as well as flare base ladders. Additional details on the equipment are available from the manufacturer.

### Electronic Air Cleaner

WESTINGHOUSE ELECTRIC
CORPORATION, Sturtevant
Division, 200 Readville St.,
Hyde Park, Boston 36, Mass., has introduced an encased Precipitron electronic air cleaner that resembles a
factory fabricated section of air duct
or plenum chamber 96 in. long with
a built-in Precipitron.

The units are available in air cleaning capacities ranging from 8330 cfm at 90 per cent efficiency to 44,000 cfm at 85 per cent efficiency.

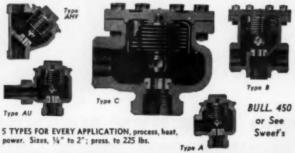


The overall cross-sectional dimensions of the units range from 5 ft 4 11/16 in. high by 5 ft 2½ in. wide for the 8330 cfm unit to 10 ft 4 11/16 in. high by 11 ft 1¾ in. wide for the 44,000 cfm unit. All are 8 ft long. Approximate net weight in pounds is from 1970 for the smallest unit to 4800 for the largest. The units are shipped disassembled.

### Nicholson Steam Traps

## **CUT HEAT-UP TIME 48%**

A large processor recently reduced the heating cycles of cookers from 105 min. to 50-60 min., by substituting Nicholson thermostatic steam traps for a mechanical type. This effected a gratifying production increase of 37%. Reasons for Nicholson's faster heat transfer: operate on lowest temperature differential; 2 to 6 times average drainage capacity; maximum air venting. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic traps send for our catalog.



W. H. NICHOLSON & CO., 175 Oregon St., Wilkes-Barre, Pa.
Sales and Engineering Offices in 33 Principal Cities

### Steam Turbine Driven Pump

G-15

Bymon Jackson Co., Pump Division, P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif., has developed a new steam turbine driven Bilton pump.



The close-coupled unit is easy to install since space requirements are small and no rigid foundation is necessary. It can be mounted at any angle (including wall mounting), and is light weight. According to the manufacturer, the close-coupled construction assures positive alignment and permits effective application of power to pump.

Standard models are recommended by the manufacturer for water supply, air conditioning, general liquid handling, and for general purpose application for plants using steam as their primary power and for use as a standby pump in plants where steam is available as emergency power. Pump sizes are 1½ in. to 3 in.; capacities to 600 gpm; heads to 320 ft.

#### Steam Control

G-16

CLEVELAND FUEL EQUIPMENT COMPANY, 7316 Associate Avenue, Cleveland 9, Ohio, is producing a new steam control for process steam production where constant pressure must be maintained despite varying load demands. The model is designed to give accurate, automatic regulation of steam pressure on any type of stoker, gas or oil-fired boiler.

A pressure controlling unit consists of bellows, floating contacts, compensating motor, and pressure adjusting mechanism. Other features include: factory-sealed plug-in relay unit containing all impulse transmitting apparatus for controlling position of the drive unit to correspond with pressure changes; signal lights to indicate when drive unit is moving toward high or low fire; selector switch with four manual positions; steel cabinet with hinged cover having same construction and dimensions as the company's damper controls.



For more data circle item code number on the postage free post card-e. 17



Dehumidifier

G-17 CARRIER CORPORATION, Syracuse, N. Y., is producing a completely portable, % his dehumidifying unit, weighing only 60 lb. The unit is fitted with casters and handholds so that it can be easily moved. It can be plugged into any standard 115 v circuit.

Under conditions of 80 F and 70

per cent relative humidity, it is said to be capable of removing as much as 18 pints of water from the air in an average space every 24 hours.

The new model has a special vertical arrangement of spiral finned evaporator coils. The constant downward drainage of water along the spiral fins maintains a damp clean coil surface, and at the same time prevents an accumulation of water on the coil, thus insuring the most effective heat transfer conditions.

### **Box Connectors**

G-18

BUCHANAN ELECTRICAL
PRODUCTS CORPORATION,
1290 Central Ave., Hillside,
N. J., is producing box connectors of
sturdy, compact design to enable
quick, positive attachment of electrical cables to device or outlet boxes.
The connectors are available for both
metallic and non-metallic sheathed
cables and are equally adaptable to
wiring of buildings or manufactured
products.

The connector for metallic-sheathed cable features extra heavy (#12 fillister head) cable-engaging screw which facilitates tightening and in-





sures more positive grip on cable. It also has an especially designed wireentryway which provides maximum protection against abrasion of wire insulation.

Both connectors are of heavy gauge stamped steel for service and durability and are heavily cadmium plated to resist corrosion. All clamping parts are designed to hold cables securely without damage to cable sheaths. Bonding-type heavy gauge stamped steel locknuts with machine cut free turning threads and sharp tightening notches permit easy tightening in hard to get at places.

Cable sizes include 14-2, 14-3, 14-4, 12-2, 12-3 and 10-2.

### Lubricated Plug Valves

G-19 HOMESTEAD VALVE MANU-FACTURING COMPANY, P. O. Box 550, Coraopolis, Pa., has added new worm and gear operated valves to its line of lubricated plug valves.

The new valves have patented selfsealed construction, port area equivalent to 100 per cent of the area of standard pipe, are cast in semi-steel, and are made in 8, 10, and 12-in. sizes. Full details may be had by requesting Reference Book 39-5 from the manufacturer.



power modernization

Even a brand new motor may be obsolete...



Ask for your copy of pictorial bulletin No. F76 showing Sterling Electric Power Drives Turning The Wheels of Industry.

you do not have control of speed

### STERLING SPEED-TROL

. . . Gives You Variable Speed Control Necessary For:

- PROCESS CONTROL OF: Temperature
   —viscosity—level—pressure—flow—etc.
- TIME CONTROL OF: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.
- EQUIPMENT ADAPTATION TO: Load variation—sequence synchronization. Size—tension—hardness or shape of materials to be processed—machined—conveyed—blended—mixed—etc.
- VARIATIONS IN: Quality—quantity—operators' abilities—etc.

STERLING ELECTRIC MOTORS

Plants: New York 51, N. Y.; los Angeles 22, California; Hamilton, Canada; Santiago, Chile.

Offices and distributors in all principal cities.



### Sealing Ring

DOUBLE SEAL RING COM-PANY, Fort Worth, Texas, is producing a new onepiece scaling ring on which the scaling member is located on the innerside of the ring. The ring has no "top" or "bottom," scals fully fromboth sides, and cannot be installed upside down. These features make it unusually adaptable for use on singlegroove, double-acting pistons in engines, compressors, and pumps.

The inside seal reduces wear on cylinder walls in equipment which has very little lubrication. Only one material is exposed to the cylinder wall. The rings are available in sizes ranging from diameters of 4-in. to 96-in.

### Electric Fork Truck

G-21

CLARK EQUIPMENT COMPANY, Industrial Truck Division, Battle Creek, Mich.,
has announced production of a new
electric battery - powered fork - lift
truck. Features of the new model include increased speed, 2000-lb capacity at 24-in. load-center, fingertip directional control lever, automatic acceleration, "deadman" safety control,
pivot-mounted steering axle, and
cushion-style tires as standard equipment.

Dimensions of the new truck are: overall length, less forks—63%-in.; overall width—34½-in.; wheelbase—37-in.; turning radius—61½-in.; minimum intersecting aisles, 57-in.



# Why TWIN STRAINERS have exceptional life\*



### \*THE REPLACEABLE DISC RING

This is a Neoprene ring embedded in the face of the disc. It insures tightness and if after long use wear occurs, it can be inexpensively renewed. For this purpose the disc can be removed through the top of the strainer in a few minutes without removing the strainer from the line.



Where liquids are exceptionally corrosive, a valve seat or "wear plate" can be supplied which can be replaced with a new wear plate when wear or pitting occurs. Not required under usual conditions, but just one more factor in adapting Twin Strainers to any service.

Many thousands of Twin Strainers in power plants, process plants, ships, and all industries needing non-stop clearing of liquids, have long demonstrated their sound qualities. Now redesigned for even better performance and lower operating cost. You will want the details — Bulletin A-13 on request.



TEN TOTAL

ELLIOTT COMPANY

Accessories Dept., JEANNETTE, PA:

## Rope

(Continued from Page 82)

The greatest caution is to use rope of sufficient size for the work in hand. In this particular type of work knots are almost always employed and it should be remembered that a knot reduces the effective strength of the rope by approximately 50%. Lashings are often drawn tight by hauling one line across another at right angles. The loss of strength at this type of contact is even greater than 50%.

### **Prevent Chafing**

If the object secured has a tendency to move, consideration should be given to the points of contact between the rope and the movable object. If possible, square corners should be avoided and if it is absolutely necessary to go around the square corner, it should be padded or protected to

reduce the tendency to break the fibers.

Chafing, due to friction, can be reduced by having all surfaces as smooth as possible or protect the rope with some type of chafing gear such as a serving around the rope or a padding on the object secured. In instances where the lashing is of a permanent nature, serving the rope with a lighter twine or, in some instances, a smaller rope, makes excellent chafing gear which can be readily removed for inspection or replacement.

When rope is placed around an object to attach it to some means of moving or lifting, the rope becomes a sling and may take the form of a temporary sling made to suit the particular object to be lifted and adjusted to length by means of a knot. Here again consideration should be given to the strength reduction due to the knot.

Where objects of the same size are to be continually handled, or when the variation in size is within reasonable limits, permanent slings can be made. Slings for this purpose are usually of two sorts.

A straight rope with an eye splice in each end can be used either as a choker by slipping one eye splice through the other and then placing the standing eye over a hook or other lifting medium, or as a suspension sling by putting the sling around the object and hooking both eye splices over the hook. This, of course, is pure suspension and gives no constriction to the load.

If objects of the same size are continually lifted with this type of sling, the wear will always come in the same sections and rapid failure at this particular point may be expected. In some instances objects are raised by sliding a bar under the object and through the eye splices, bringing the loop of the sling over the hook. Slings used in this manner will last longer than the choker sling as the hook is usually of reasonable diameter and smooth, but the wear is still confined to one short section.

Unless there is some special reason for using a single rope of this type, the loop type sling or a long rope, spliced endless, is more economical because the wear is seldom localized in any particular section. More rope is required for slings of this type but because of the distribution of the surface wear, they are usually more economical.

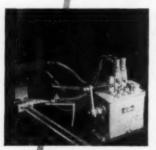
The illustration on the initial page of this discussion demonstrates the efficiency of this latter type of sling when placed in various ways around an object to be handled.

Slings should be examined frequently for accidental cuts or deep abrasions and, if damaged, should be either discarded or repaired. Anything which can be done to reduce sharp angles, protect against sharp corners, or to reduce surface abrasions will give added life to rope used as slings.

Power can be applied to rope for hoisting in several ways—by winding on a drum, by a winch or niggerhead, in which case the friction of the rope around the capstan determines the lifting factor,

In Press Operations In Shear Operations In Conveyor Systems

# CUT 'DOWN TIME'... INCREASE PRODUCTION... REDUCE OPERATING COSTS...



Here are typical comments of manufacturers using the new Manzel Automatic Spray System: Dies, punches, and shear knives wear up to three times as long! Only 1/10 as much oil now being consumed!

Punch breakage greatly reduced.

Manzel Spray Lubricators force automatically timed jets of oil spray directly onto the punches, ahear knives, dies, rollers, or other parts. The system is readily installed on any type of equipment, large or small. Manzel engineers will gladly assist you in solving any lubrication problems.

Write today for descriptive folder.

WITH MANZEL SPRAY LUBRICATION

Manzel DIVISION OF FRONTIER INDUSTRIES Inc.

318 BABCOCK STREET, BUFFALO 10, N. Y.

or it can be used by hand or power through movable sheaves in a tackle assembly.

If rope is wound on a drum, a firm lay should always be used, especially if one course is wound on top of another. Under such conditions soft laid rope has a greater tendency to cut or abrade the lower courses than where a very firm lay is employed.

For use over a capstan a reasonably firm lay will also give the longest service but this rope must be sufficiently flexible to handle easily and rapidly. Where the turns are taken off the head each time a hoist is made, care should be used to maintain the balance of the turns in the rope as this is one of the conditions where rope is often destroyed by the continual loss of turn due to throwing the turns off the winch head. When turn is gained under these conditions, time must be taken to straighten the rope because it will become too kinky to handle, but when turn is lost, this precaution is often neglected and the rope is destroyed by running too much turn back into the strands.

The pitch or slant of the capstan surface is important in rope conservation and should be just sufficient to slide the turns toward the small end with the given loads. Any steeper pitch causes excess friction as it increases the length of each successive turn around the capstan, and the length of these turns must decrease as they approach the small end. Continual lifting of heavy loads with a steep capstan will rapidly destroy the rope by surface friction as the rope renders over the capstan. The capstan should be kept as smooth and free from rust as possible, especially if the load is held at a given level. Heavy loads held in one position too long may cause damage by overheating the fiber in contact with the revolving capstan head.

### **Need for Conservation**

The high cost of hard vegetable fibers and the need for conservation is of vital concern to every user of cordage. Careful consideration of the suggested principles for rope protection can mean substantial savings in rope costs.

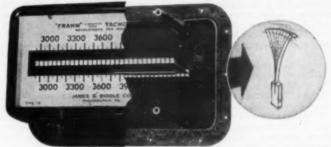
## BIDDLE

## Instrument News

### THE FRAHM® RESONANT REED IS THE

No Oiling • No Maintenance • Imposes No Load on Machine Under Test

"NATURAL" WAY OF MEASURING SPEED



The speed measuring device in a Frahm Tachometer is extremely simple. It consists of a set of consecutively tuned spring steel reeds mounted in a case with a scale calibrated in rpms or vpms. The predominantly vibrating reed indicates speed at a glance. The principle is based on the natural phenomenon of resonance-the quality of an elastic body to vibrate vigorously when subjected to small rhythmic impulses at a rate approximating its natural frequency. No rotating machine is absolutely free of vibration. However imperceptible, the vibration can be measured with a Frahm Resonant Reed Tachometer by touch or permanent mounting. (The same principle is used to measure and indicate electric frequency.)

### **Guaranteed Accuracy**

Careful research and many years of practice in the art of manufacturing and tuning reeds enable our craftsemen to guarantee accuracy to within 0.5% of the rated frequency of vibration.

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of ranges from 25 rpm to 48,000 rpm.
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## **NEWS** for Southern Industry

Atlantic Steel Company Celebrates 50th Anniversary

ATLANTIC STEEL COMPANY, AT-LANTA, GEORGIA, is celebrating its 50th anniversary this year.

Founded in 1901 by eight Atlanta business and professional men, the company was first named the Atlanta Steel Hoop Company and manufactured only cotton ties and cooperage hoop from steel purchased in Pittsburgh.

Today the company operates three open-hearth furnaces, is building a new 60-ton electric furnace, and manufactures 65 different products in thousands of sizes and shapes.

In conjunction with the company's anniversary celebration, Charles F. Stone, Chairman of the Board, has authored a book "The Story of Dixisteel," which covers the history and growth of the company during its first fifty years.

The book, just released by an Atlanta publisher, will be sent to the company's customers and friends, and to various libraries and colleges.

In 1906 the company's name was changed to Atlanta Steel Company and its present name was adopted in-

In 1922 Mr. Stone, then sales manager for the company, created the widely-known "Dixisteel" trade-mark. He saw in the combination of words a natural link between the South and the company's southern-made prod-

Mr. Stone became president of Atlantic Steel Company in 1932 and remained in that capacity until 1947 when he was made Chairman of the

He was succeeded to office by Ros-ERT S. LYNCH who joined the firm in 1944 as general superintendent. Mr. Lynch was formerly superintendent of operations for the Alloy and Stainless Steel Division of Republic Steel Corporation, Massilon, Ohio, before coming to Atlanta.

By 1906 the company was making its own steel and in 1925 established a record of producing 70,200 gross tons of ingot steel.

Last year the company broke all previous records, including those established during the war years, by producing more than 200,000 net tons. Announced earlier this year, Atlantic Steel Company is engaged in an

### **FUTURE EVENTS**

### Of Engineering Interest

AMERICAN SOCIETY OF MECHANICAL ENGINEERIS, C. E. Davies, Sec'y, 28 West 39th St., New York, N. Y. June 25-29, Oil and Gas Power Division Conference, Baker Hotel, Dallas, Texas.

NATIONAL ASSOCIATION OF POWEB ENGINEERS, INC., A. F. Thompson, Dir. of Exhibits, Suite 1650, 176 West ATIONAL ASSOCIATION OF ENGINEERS, INC., A. F. Thompson, Dir. of Exhibits, Suite 1959, 176 West Adams St., Chicago 2, Ill.
Aug. 21-23, Golden Anniversary National Power Show, Hotel Plaza, San Antonie.

AMERICAN SOCIETY OF MECHANICAL

ERICAN SOCIETY OF MECHANICAL ENGINEERS, C. E. Davies, Sec'y, 23 West 39th St., New York, N. Y. ept. 16-14, Industrial Instruments and Regulators Division and Instrument So-ciety of America Exhibit and Joint Con-

ference, Houston, Texas.
Sept. 24-26, Petroleum Mechanical Engineering Conference, Hotel Mayo, Tulsa,

Oct. 11-12, Fuels and AIME Coal Divisions Conference, Hotel Roanoke, Roan

oke, Va. Nev. 25-30, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

expansion program during its anniversary year which the company expects to result in a 50 per cent increase in the production.

The company's three open hearth furnaces, blooming and billet mills, two hoop mills, wire, rod and nail mills, together with its shops and other facilities sprawl over a 200-acre

### Over 700 Engineers Attend A.S.M.E. National Spring Meeting

The National Spring Meeting and Region IV Student Branch Conference of The American Society of Mechanical Engineers was held in Atlanta, Georgia, April 2-5, 1951. The extensive technical program was carried in the April issue of SP&I.

Particularly applicable to Southwestern processing operations was the extensive seminar on cooling towers. Two of the excellent papers have been extensively reported in this issue and others briefly summarized. Check this feature report for "Gulf Coast Oper-

ating Data" by Harry G. Hiebeler of the Houston Lighting & Power Company and "The Deterioration of Wood in Cooling Towers" by engineers of the Forest Products Laboratory.

Lower left—K. R. Daniel, American Cast Iron Pipe Co., Birmingham, Ala.; Francis C. Smith, Editor, Southern Power & Industry; Steve Moxley, also of American Cast Iron Pipe Co.; Ernest Hartford, A.S.M.E., New York, N. Y.: J. B. Jones, Virginia Polytechnic Institute, Blacksburg, Va.; and Howard Degler, Marley Company, Kansas City, Kans.

Below-Guy Mankin, Manufacturers Agent, Atlanta, Georgia; S. B. Flagty, Ebasco Services, New York, N. Y.; and Jas. G. Nichols, Manufacturers Agent, Atlanta, Ga.





## Allis-Chalmers Southern Representatives

Newly named Allis-Chalmers general machinery division sales representatives to four Southern States are John E. Watson to the company's Birmingham district office; James P. Boger, Charlotte; Stephen Hogg, Jr., Atlanta, and Wilson O. Vaughn, Richmond. Watson and Hogg are electrical engineers and Boger and Vaughn mechanical engineers.

### Unistrut-Atlanta

UNISTRUT PRODUCTS COMPANY, Chicago, Illinois, has opened a branch office and warehouse at 188 Hunter Street, SE., ATLANTA, GEORGIA, to serve the southeastern states.

This move is expected to provide more efficient and direct service for dealers and representatives in the states of Alabama, Georgia, the Carolinas, Florida and Eastern Tennessee. Mr. George Payton has been appointed Southeastern District Manager.

### Nat'l Airoil Burner Expands

THE NATIONAL AIROIL BURNER COM-PANY of Philadelphia, Pa., has announced the formation of their Chemical and Petroleum Division. Mr. WILLIAM FERGUSON, Vice President, heads the new division.

The Technical Staff of the Chemical-Petroleum Division is under the direction of Mr. Frederic Bauer, Chief Technologist. The Mechanical Engineering Staff is under the supervision of Mr. John J. Griffin, Chief Engineer.

### Johnson Joins Oil Well Supply

EDWARD W. JOHNSON, formerly manager of the centrifugal pump department of National Transit Pump and Machine Company, Oil City, Pa., has been named consultant on centrifugal pumps at WILSON-SNYDER MANUPACTURING DIVISION of OIL WELL SUPPLY COMPANY at Braddock, Pa.

While with National Transit Mr. Johnson designed that company's Types E-S and C-S chemical, processing and general service centrifugal pumps, which were acquired by Wilson-Snyder early this year as the National Transit properties were being liquidated.

A native of Saratoga, Texas, Mr. Johnson was graduated from the University of Texas in 1933 and then spent seven years with the engineering department of the Gulf Oil Company refinery at PORT ARTHUR, TEXAS. From 1940 to 1945 he served as chief mechanical engineer for the Texas Company refinery at Port Arthur.

### New Collier Plant-Dallas

New headquarters of the C. H. COLLIER COMPANY recently opened at 154 Payne Street in DALLAS, TEXAS, was designed especially to furnish a complete "service station" of sales, parts and repair for the growing

number of owners of mechanical han-

Head of the company, largest dealer for HYSTER equipment in Texas, is C. H. COLLIER, SR., identified with the heavy machinery business more than 20 years. A native Texan, Collier had practical engineering experience in the railroad, municipal and highway engineering and construction fields before becoming general sales manager for one of the largest shovel and dragline manufacturers in the country.



BALDWIN - HILL CO. 604 BREUNIG AVE. TRENTON 2, NEW JERSEY





### NATIONAL AIROIL BURNER COMPANY INC.

1279 Sedgley Ave., Philadelphia 34, Pa. Southwestern Division, 2512 So. Bled., Houston 6, Tex.

### Bovay, Houston, Adds to Staff

Three engineers have recently been added to the staff of H. E. Boyay, JR., Consulting Engineers, Esperson Building, Houston, Texas. They are AARON J. COHEN, who has been a mechanical and production engineer in the Houston area for a number of years, and who, since the war has been a consultant on refinery, chemical and natural gasoline plant design: DAVID M. BENTLEY, who is experienced in time and motion study; and BERNARD R. BOGAN, who has been a consulting civil engineer in the Houston-Austin area, doing field work in city utilities, subdivision development, housing projects, and street paving.

### Nordberg-Louisiana and Florida

NORDBERG MANUFACTURING Co., MILWAUKEE, Wis., has announced the oppointment of two new distributors in the Southeast.

E. M. WAKEMAN & ASSOCIATES, LAKELAND, FLORIDA, is the new industrial distributor for Nordberg 4FS Diesel engines in the state of FLORIDA and the Gulf counties of Mobile and Baldwin, ALABAMA. The Wakeman company maintains salesmen in Jacksonville, Orlando, West Palm Beach, Miami, Tampa, and Pensacola.

YAUN EQUIPMENT COMPANY, 2120 North Third St., BATON ROUGE, LA., is distributor for the Diesels in the southern half of LOUISIANA.

### Raybestos-Manhattan— N. Charleston, S. C.

Election of ALVIN F. HEINSOHN as vice president of RAYBESTOS-MANHAT-TAN, INC., was announced recently.

Mr. Heinsohn is now vice president in charge of the company's General Asbestos & Rubber Division at NORTH CHARLESTON, S. C. He has been general manager of the North Charleston plant since 1944. Mr. Heinsohn is also a director of the company.

### Houston Company Cited

HUGHES TOOL COMPANY, HOUSTON, TEXAS, which completed its third successive year of accident-free operation, heads the list of companies cited by the STEEL FOUNDERS' SOCIETY OF AMERICA for achievement of perfect safety records. According to a report by F. Kermit Donaldson, Executive Vice President of the national technical society, the Steel Casting Safety Campaign resulted in perfect 1950 safety records for the Houston company and six Eastern companies, with no lost-time accidents.



Charles W. Bloedorn

### Allis-Chalmers—Southeast

CHARLES W. BLOEDORN has been named Southeast regional representative for ALLIS-CHALMERS steam turbine department with headquarters in Atlanta, according to an announcement by D. S. KERR, manager of the company's Southeast region.

Since 1948, Bloedorn had been in charge of the sales group in the company's steam turbine department handling turbines and turbine-generator units in sizes of 10,000 kw and larger. He is a member of the American Society of Mechanical Engineers.

### Snyder Joins Automatic, Georgia

Appointment of Vernor O. Snyder as field engineer for the firm of John W. & Wm. H. Carlson, 33 North Avenue, Atlanta, sales representative for the Automatic Transportation Company, Chicago, manufacturer of electric industrial trucks, was announced recently.

Snyder was formerly with the Material Handling Equipment Company, Atlanta, as sales manager, and earlier was with the Industrial Electronics Corporation, Newark, N. J., as sales engineer.

### Kittredge Joins American Water Softener

THE AMERICAN WATER SOFTENER COMPANY, of Philadelphia, has announced the appointment of ARTHUR E. KITTREDGE, mechanical engineer, to direct a newly formed division of the company. This division will develop the Deacration Process for the removal of free oxygen and other gases from boiler feed water.

Mr. Kittredge recently concluded a long association with The Cochrane Corporation, Philadelphia, as Vice President and Chief Engineer.

### Hanes Heads Ecusta Paper

ECUSTA PAPER CORPORATION, PISGAH FOREST, N. C., has announced the election of JOHN W. HANES to the office of president and chairman of the board of directors.

### York Promotes Skipper-Atlanta

J. H. SKIPPER, 2543 Habersham Rd., N. E., Atlanta, has been promoted from a Sales Supervisor to District Commercial Sales Manager of York CORPORATION'S SOUTHERN DISTRICT.

Mr. Skipper, a native of Arkansas, was formerly Field Supervisor with Frigidaire, was employed as Sales Supervisor with the W. P. Galloway Company, Frigidaire distributor in Little Rock, and was with Herbert Roberts, Frigidaire distributor in Ft. Smith. Ark.

From 1941 until 1945, Mr. Skipper was with the U. S. Division Engineer Office at Columbus, Ohio, and until recently, was Sales Supervisor for York Corporation in the Charlotte, N. C., zone.

### Warren-Baltimore

To meet demands of industrial expansion in the BALTIMORE area, WARREN STEAM PUMP COMPANY, INC., WAITEN, MASSACHUSETS, has appointed HARRY W. FAUNT LE ROY & ASSOCIATES, Standard Oil Building, Baltimore, as their agents. The Faunt Le Roy organization has had many years of experience in the pumping equipment field and are in close contact with local industrial activity.

### Sylvania Electric-Dallas

The Lighting Sales Department of SYLVANIA ELECTRIC PRODUCTS, INC., has organized a new division office and warehouse operation with head-quarters in DALLAS, TEXAS.

T. J. EWBANK, former field representative, has been appointed Division Sales Manager of the Dallas Division. Mr. Ewbank, who has been with Sylvania since 1942, has been covering the Dallas area and all the territories comprising this new division.

### S. D. Black Dies

S. DUNCAN BLACK, President of THE BLACK & DECKER MFG. Co., manufacturers of portable electric tools, died suddenly on April 15 in BALTIMORE, MD. Cofounder of the firm with Alonso G. Decker 40 years ago, Mr. Black had continued as the active head of the company until his death.

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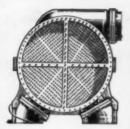
Today, as manufacturers of detergents . . . we receive and ship in carload and truckload quantities, with the entire operation being accomplished by a force of three men and one foreman."

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Technical Service Representatives Located in Principal Cities of United States and Canada

## **Cooling Towers**

(Continued from Page 70)

cussion of the significant properties of redwood, types of deterioration, and the conditions prevailing in cooling towers, the complete Forest Products Laboratory paper covers detailed laboratory tests of slats removed from 12 towers after 6 to 8 years service. These specimens exposed to five fungi showed much greater loss in decay than pieces of unused redwood. Thin cross sections exposed to solutions of sodium carbonate and sodium hypochlorite were less resistant to

decay than those exposed to water.

How Southern and Southwestern plant engineers can obtain more complete data on this discussion is outlined in the reprint tabulation.

Plant-tested check-chart maintenance data for industrial cooling equipment in Southern and Southwestern industrial and power plants was featured on page 106 of the May Maintenance issue of Southern Power & Industry.

The discussion, authored by Howard E. Degler, Technical Director of The Marley Company, Inc., Kansas City, Kansas, emphasized that the life of any piece of water-cooling equipment is directly dependent upon its inherent qualities, type of service, severity of operation, general care and maintenance and climatic environment.

### **Cooling Tower Symposium Reprints**

Reprints of the following papers may be ordered from The American Society of Mechanical Engineers Order Department, 29 W. 39th St., New York 18, N. Y. Prices: 25¢ to members and 50¢ to nonmembers. Remittances should accompany orders for \$2 or less.

"Economic Factors in the Design of Cooling Towers"—Paper No. 51-S-5. By A. R. Le Bailly, Sargent & Lundy, Chicago, Ill.

"Comments on Cooling Tower Economics"-Paper No. 51-S-6.

By Louis Elliott, Ebasco Services, Inc., New York, N. Y.

Outlines method of analysis for comparing performance obtained with cooling towers, as against direct use of river water for condensing service in steam-electric stations. Data are given for a specific case in Kansas for which 10-year water temperature records and corresponding weather information are utilized.

"Selection, Operation and Maintenance of Industrial Cooling Equipment"
—Paper No. 51-S-7.

By Howard E. Degler, The Marley Co., Inc., Kansas City, Kansas.

Recent headlines of water crises have brought to public attention hasic water shortages that engineers have predicted for years. Conservation and re-use of water have become a necessity in many areas. Also check Mr. Degler's discussion on "Industrial Cooling Equipment Maintenance," page 106 in the May issue of SOUTHERN POWER & INDUSTRY.

"Recirculation in Cooling Towers"-Paper 51-S-8.

By Joseph Lichtenstein, Foster Wheeler Corporation, New York, N. Y.

Paper shows that recirculation is a characteristic of the surroundings of a cooling tower installation and must be considered by the use of his economic calculations and by the manufacturer for the proper selection of a cooling tower to reach a specified cold water temperature.

"Operating Experiences with Cooling Towers in the Central Gulf Area"
---Paper No. 51-S-9.

By Harry G. Hiebeler, Houston Lighting & Power Co., Houston, Texas.

"Problems Relating to the Operation, Maintenance and Chemical Control of Forced Draft and Induced Draft Cooling Towers for Steam Electric Generating Stations"—Paper No. 51-S-10.

By V. F. Estcourt, Pacific Gas & Elec. Co., San Francisco, Calif.

Cooling towers performance must be considered not only in terms of heat dissipation but also in relation to the overall results obtainable with a particular consbination of tower, condenser and tarbine. There is an important relationship between turbine leaving losses and the optimum tower size. This involves economic size of tower and certain operating problems which affect the station heat rate. Problems of used due to higher cooling water temperature. Problems of recirculation, fan blade failures and noise nuisance are also discussed.

"The Deterioration of Wood in Cooling Towers"—Paper No. 51-S-11.

By R. H. Baechler and C. Audrey Richards, Forest Products Lab., Madison, Wis.

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(Continued from p. 18)

B-10 STOKER—Catalog, 14 pages—Illustrates and describes "Perfect Spread Stoken" Discusses feeder construction, operation and advantages; rotor; grate drive (hydraulic); grates (atationary, dumping, continuous ash discharge); cinder reinjection system; overfire air systems; and installation.—AMERICAN ENGINEERING COMPANY, Cumberland and Aramingo Ave., Philadelpha 25, Pa Philadelphia 25, Pa.

B-11 INDUSTRIAL TOOLS — Catalog "Severance All Stars." 14 pages—Concise listing of the company's most popular items; Mills, deburring cutters, countersinks; sinks; reamers, and shanks. Illustrations, dimensions, and prices are included.—SEVERANCE TOOL INDUSTRIES INC., Saginaw, Mich.

B-12 FREON COOLERS—Catalog Section 101, 12 pages—Describes and illustrates freen or ammonia coolers of the dry expansion type, for air conditioning, process, industrial and commercial refrigeration applications. Charts and tables show cooling surface requirements. Typical piping arrangements are included.—PATTERSON-KELLEY CO., INC., 428 Burson St., East Streudsburg, Pa.

B-13 WELDING STAINLESS STEELS—Handbook, 48 pages—Describes all phases of stainless steel are welding, including metallurgical background, specific uses of alloying elements, and other pertinent data concerning uses and specifications of said type of the company's stainless steel electrode.—THE McKAY COMPANY, 242 McKay Bidg., Pittsburgh 22, Pa.

B-14 SOLDERLESS CONNECTORS—Bulletin 750, 4 pages—Describes the company's improved line of connectors for solderless splicing and terminating of electrical wires. Contains detailed descriptive data, installation instructions, and ordering information. Hiustrated.—B UC H A N A N ELECTRICAL PRODUCTS CORP., 1290 Central Ave., Hillside, N. J.

B-15 PACKINGS AND GASKETS-Loo B-15 FACKINGS AND GASKETS—Loose-lead Catalog. 100 pages—Illustrates and describes R/M packings and gaskets. Charts show recommendations for packing various types of equipment. Suggests pro-cedure for installation. Includes fahrenheit and centigrade conversion table; stean ta-ble, and other pertinent data.—RAYBESTOS-MANHATTAN, INC., Packing Division, Man-

B-16 WATER TREATMENT - Technical B-16 WATER TREATMENT—Technical Bulletin, 4 pages—Describes the need for organics in altering the nature of studge in order to make it non-adherent. Covers practical and theoretical considerations involved in use of organics. Huatrated.—E. F. DREW & CO., INC., Power Chemicals Division, 15 E. 26th St., New York 16, N. Y.

B-17 INDUCTION MOTORS - Booklet B-4739, 28 pages — Discusses the large, polyphase induction motor, and its place in industry. Summarises types and features of squirrel-cage motors for conlarge, polyphase induction motor, and replace in industry. Summarises types and features of squirrel-cage motors for constant speed drive, and wound-rotor motors for adjustable speed drive. Unit type stator and all-metal rotor are discussed. Hilustrates applications in specific industries.—WEST-INGHOUSE ELECTRIC CORP., P. O. Box 1917, Pittsburgh 30, Pa.

B-18 PAINT SPRAY EQUIPMENT-Folder, 4 pages—Describes the "P Miser," an electronic accessory for spray equipment, which charges paint ricles with negative electrical charge to be attracted to item being coated. Hustrated with diagrams and photographs.—ASHDEE PRODUCTS, INC., 18029 Dixie Highway, Homewood, Ill.

B-19 NON-MELTING WAXES—Technical Rulletin 101, 3 pages—Describes a new non-melting form into which ordinary waxes such as paraffin, microcrystalline, petrolatum, carnauba, candellila, ouricuri, beeswax and others have been converted for application where waxes are used at elevated temperatures.—FLEXROCK COMPANY, Filbert & Cuthbert, West of 26th, Philadelphia 4, Fa.

B-20 ELECTRICAL RESISTANCE TEST-ER—Bulletin 21-85-26, 8 pages— Three low-cost "Megger" electrical resis-Three low-cost "Megger" electrical resistance teaters for use in all types of industry. Instruments include the "Midget Megger Insulation Tester," the "CVM Constant Voltage Type," and the "Midget Megger Circuit Testing Ohmmeter."—JAMES G. BIDDLE CO., 1316 Arch St., Philadelphia 7.

B-21 TUBING STEELS—Technical Bulletin 12F, 6 pages—Information on dealgn, fabrication, and use of tubing in elevated temperature and high pressure applications. Contains analyses, physical and mechanical properties, creep strength, short time elevated temperature tensile strength, and oxidation resistance of 14 tubing steels.—THE BARCOCK & WILCOX TUBE COMPANY, Beaver Falls, Pa.

B-22 FEEDWATER CONTROL-Bulletin B-22 FEEDWATER CONTROL—Bulletin No. 489, 16 pages—Performance report illustrates and describes three different types of boiler feed control systems in plants of Georgia Power Company: Plant Yates, 3-influence control through bydraulic couplings of boiler feed pumps; Plant Atkinson, conventional 3-influence control tuding feed control valve: Plant Arkwright, 2-dlement air operated control.—NORTHEEN EQUIP.
Machine Co., Erie 2, P. Machin

B-23 MATERIALS HANDLING—Catalog, 44 pages—Materials handling equipment covered includes as a not electric fork lift trucks, motorized hand trucks, hand lift trucks, and hand and electric hoists. Various attachments for the industrial trucks are described. Illustrated.—TALE &

TOWNE MANUFACTURING COMPANY, Philadelphia Division, 11000 Roosevelt Blvd., Philadelphia 15, Pa.

B-24 BOILER WALLS-Catalog, 12 pages B-24 Hourstee and describes tube-supported walls for industrial boilers. Ex-plains installation. Engineering drawings show typical jobs, and series of photographs show a job being erected.—BIGELOW-LIPTAK CORPORATION, 2842 W. Grand

B-25 PISTON RINGS-Catalog, 16 pages B-25 PINION RINGS—Catalog, 1e pages Thirteen different types of metal-lic piston rings are described with uses ex-plained, and instructions for ordering.— DOUBLE SEAL RING COMPANY, P. O. BOX 550, Port Worth, Texas.

B-26 INDUSTRIAL BRAKES — Bulletin 1996—Presents information and specifications on the company's 1509 and 2000 series all atecl. power, press brakes, for heavy sheet metal and light plate work—ATRTHERM MANUFACTURING COMPANY. Machinery Division, 773 South Spring Ave., St. Louis, Mo.

B-27 ZEOLITE SOFTENERS — Bulletin No. 4536, 16 pages—Gives complete description of the process and the field of application of bydrogen scolite softening and its relation to the sodium zeolite softand its relation to the sodium zeolite soft-ening process. Explains zeolites and equip-ment used in the process. -- COCHRANE CORPORATION, 17th St. below Allegheny Ave., Philadelphia 32, Pa.

B-28 TROUS Bulletin 1100-PRD-204, 1 pages—Describes polarized field frequency controls for synchronous motors, full-voltage, reduced voltage, and part winds. controls for synchronous motors, full-voice age, reduced voltage, and part-winding starting. Includes ratings, weights, dimen-sion drawings, wiring diagrams, layout drawings, and specifications.—ELECTRIC MACHINERY MFG, COMPANY, Minneau

B-29 CENTRIFUGAL PUMPS - Bulletin B-29 CENTRIFICAL PUMPS — Bulletin 2200 — Describes and illustrates line of general purpose pumps of the horizontal, end-suction centrifugal type which may be driven by electric motors in sizes from ¼ hp to 150 hp, with capacity from 10 spm to 5500 spm.—PEERLESS PUMP DIVISION, FOOD MACHINERY CORPORATION, 301 West Ave. 26, Los CORPORATION, Angeles 31, Calif.

B-30 DUST PRECIPITATORS — Bulletin 1728, 12 pages—Covers new dust precipitator designed to handle fly ash, cinders, and industrial dusts for use where a compact, economical, all purpose mechani-cal type dust precipitator is required. Il-lustrated with photographs and drawings.— AMERICAN BLOWER CORPORATION, Dept. D-12, Detroit 22, Mich.

B-31 DUST CONTROL-Booklet, 50 pages B-31 DIST CONTROL—Bookiet, so pages General treatise on dust control includes sections on exhaust hoods and piping; seven types of dust collecting equipment; exhausters and drivers; and maintenance of dust control systems.—PANGBORN CORPORATION, Hagerstown, Md.

B-32 SUBSTATION - Booklet B-4692. B-32 pages—Illustrates and describes the company's CSP power transformer as a completely packaged, single-feeder substation. pletely lackaged, single-recter succession, available in ratings from 300 kva to 3,000 kva at high voltages 69 kv and below and low voltages of 1501 to 15,000 volta—WESTINGHOUSE ELECTRIC CORPORATION, Box 2092, Pittaburgh 39, Pa.

B-33 REFRACTORIES FOR BOILER
Three-color Illustrations show application of
plastic fire brick and castable refractories
for new construction and maintenance. Various types of settings and enclosures are ilinstrated and advantages of plastic of the color of the



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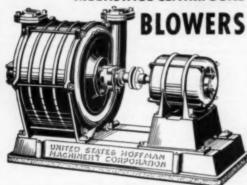


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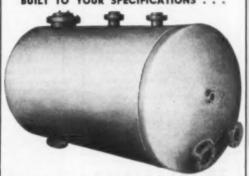
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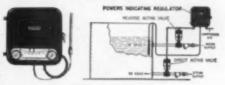
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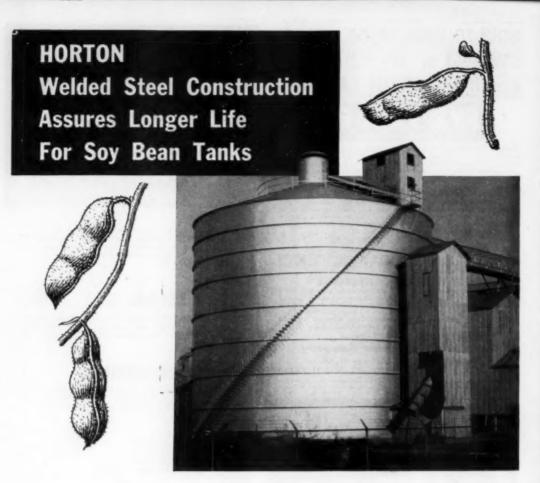
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